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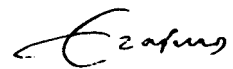


Consultores em Transportes Inovação e Sistemas, S.A.

In cooperation with:



INFRAS -Consulting, Analysis & Research



Erasmus University Rotterdam



Deutsches Institut für Wirtschaftsforschung
German Institute for Economic Research

***STUDY ON VEHICLE TAXATION IN THE
MEMBER STATES OF THE EUROPEAN UNION***

FINAL REPORT

January, 2002

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EXECUTIVE SUMMARY

Vehicle taxation in the European context has been an increasingly discussed subject in the last few years. Despite all the convergence treaties that have been driving European policies, this issue remains deserving an exception regime within Europe, where the existing country borders are still making the difference for those aspiring to own a vehicle. Different vehicle taxation systems in the various countries are commonly seen as hindrances to such convergence, deserving an in-depth analysis from which further knowledge should arise.

The study that has been undertaken has evaluated these hindrances in the context of the European Member States, developing a clear understanding of the current situation, modelling expected changes in response to possible changes of taxation schemes and presenting an interpretation of the results achieved as well as policy recommendations built on those.

As defined in the Terms of Reference, This study has focused on the effects of Registration Taxes (RT) and Annual Circulation Taxes (ACT) in a set of nine Member States, representing three levels (high, medium, low) of the Registration Taxes. Evaluation of the present situation is made with respect to the contribution of these vehicle taxes to National Budgets, and their effects on the functioning of the Internal Market and on European Citizens.

The anticipation of the existence of significant impacts resulting from the wide differences on vehicle taxation systems raised the need for further evaluation of the feasibility of taxation systems approximation, as stated in the Terms of Reference. Underlying this approximation exercise is "budget neutrality", a concept implying that any proposed change of the Registration Taxes must be fully compensated by increases in Annual Circulation Taxes and, eventually, also fuel taxes.

For this, models have been developed that relate the levels of these taxes with car prices, car sales, car ownership and average age fleet. Statistically significant relations were found, but the scale of impacts of the existing differences was lower than possibly expected, as some other factors also come into play, namely differences in purchasing power among the countries studied, and a smoothing of the retail price differences, by the car industry. It was seen that the car industry smoothes retail prices in order to reduce the effects of higher registration taxes and lower purchasing power on the sales volumes.

In parallel, consideration has been made of the possible effects of taxation systems on abandoned cars, tax avoidance and level of demand for scrappage schemes. In all these cases no evidence was found about the existence of a clear connection.

With regard to the functioning of the internal market, the existing strong differences of car taxation levels in the nine studied countries certainly may be seen as a market distortion from the consumers' point of view. This was evident before the start of the project and there would be no added value in just stating the obvious.

But several key findings in the study have allowed a better understanding of the problem:

- a) For the countries studied, the essential features of the car taxation regime predate the introduction of the European Single Market, and there is no signal of taxation regime changes with strategic goals of industrial competitiveness;
- b) However, it is certainly no coincidence that low registration taxes are found in countries with strong car manufacturing traditions, and high registration taxes in two countries with strong environmental policies (DK and FIN) and in another with heavy requests on fiscal revenue and balance of payments (EL)
- c) It was also found that registration taxes have a statistically significant influence on car sales volumes, but with a significant lower weight than the purchasing power of the inhabitants of each country.
- d) The effect of registration taxes on the final price of new cars is somewhat smoothed by the voluntary reduction of base prices by the industry in the countries where those taxes are higher, and their increase in the countries where those taxes are lower. The Commission informs us that numerous complaints are received. In general, the level of transparency of the markets will increase with the introduction of the Euro, and this may lead to increases in the number of complaints.
- e) Direct empirical research has shown that it is not only possible but also even relatively easy to buy a new car in one country and import it and register it in another country. The main problem seems to be associated with the lack of comprehensive and easily accessible information on the often rather complex procedure for a person doing it for the first time.
- f) No further barriers have been clearly identified either with regard to parallel imports from one country to another, or to a citizen migrating from one country to another taking his car along and registering it in the new country of residence. Direct costs (fees paid and time costs) are reported to be low. Moreover, there is a visible presence of parallel imports, but its small dimension in relation to the total market of the importing countries show that either there is some fear of later discrimination (for instance in maintenance operations) or perhaps the problem of price differences is not perceived as serious enough to justify these (rather lower) transaction costs by a large number of consumers. Thus, while this is not reflecting a situation of a European uniform market, it is still reflecting a rather open situation;

In all the countries studied, vehicle taxation is, and has been for several decades, a strong component of national budgets, although with rather different approaches from one country to another. No evidence has been found of changes in the general approach of any country since the introduction of the Internal Market. This may provide indication that such differences are due to the inertia of the taxation issue, and not to the use of taxation as a mean to distort competition. This inertia is, in turn, easily understandable in view of the relative weight of these taxes in all the national budgets (finance ministers' reluctance to move) as well as of the number of people affected and the underlying psychological meaning of car ownership for the households (high risk of public protest in case of changes).

The final section of the study has dealt with the possible impacts of reductions of the Registration Tax in the High Taxation countries, taking into account the previously explained concept of budget neutrality. Three scenarios for this reduction were considered each one with variants for the scheme of State revenue compensation. In the Scenarios 1 and 2, the scope of changes seems to be feasible, and realistic, and the impacts on vehicle sales and use have been modelled with reasonable results. The exercise developed in Scenario 3, however, resulted less feasible since a huge transfer of taxation for fuel would have to occur. Therefore, it should be seen as a more academic approach to tax approximation.

An evolution towards more similar fiscal regimes for the automobile is envisageable, but it must be recalled that car fiscal elements are recognised not only as a significant revenue generators but also powerful policy instruments. Thus, when confronting any pressure towards this approximation, each country will want to consider, not only the budget neutrality constraint with which we have worked in the project, but also how to maintain the same kind of positive or negative stimulus that was being delivered by the registration tax at its previous level. So, there are really two issues at stake here:

- the distortion of prices in the different national markets, thus placing its residents in different situations; and
- the utilisation of car taxation regimes by different countries pursuing different secondary purposes;

The main conclusions from the analysis of expectable impacts of reductions of Registration Tax are as follows:

- only a small part of the retail prices differences will abate (full suppression of RT differences would reduce 20% of the retail price differences);
- car sales in the countries going through this reduction would increase, but only by about one tenth of the percentage of RT reduction;
- on the increasing side, if this is concentrated on ACT there is a risk of an increase of avoidance of this tax, and if the burden is placed on fuel taxes, less driving would occur;
- transfer of fiscal revenue from RT to ACT makes it more stable, less susceptible to economic cycles, as the taxation basis is the installed stock of vehicles and not the flow of new vehicles;
- in all cases, introduction of these measures has to be done with some transition period to avoid excessive penalisation of the people who bought their cars with high levels of RT just before the change;
- in all cases, parallel imports would diminish by action of these measures, but the introduction of the EURO and the added comparability thus achieved may have an influence in the other direction;
- However, and in our view, it should be carefully assessed whether the choice of cleaner vehicle could possibly be more strongly influenced through differentiation in RT than in ACT, with regard to the growing environmental concerns underlying the definition of vehicle taxation regimes. Thus, some leverage for that purpose might possibly be lost following a reduction of RT.

Our concluding opinion on this matter is that many citizens would see this approximation as positive, although this is not a first order item on their agenda. On the other hand, several national governments will probably resist to this change (even if budget neutrality is feasible) because of their wish to keep on addressing secondary policy goals that may justify the current taxation level. This would imply that such approximation could have to be carried out along a given transition period, during which each governments would try to develop alternative strategies to keep on addressing those secondary goals of their fiscal policy.

We, therefore suggest that serious thought is given to the fact that these changes seem wise and appropriate, if done progressively. Given the typical duration of political cycles, a transition of 4 to 5 years would probably be adequate. This could bring benefits both to citizens and to Governments, considering that the taxation changes under analysis not only can be important for the image of the Internal Market but can also bring higher fiscal stability for Governments and less suspicion from citizens about the reasons for such price differentials.

1 INTRODUCTION

1.1 Purpose and Scope of the Study

The Terms of Reference of this study establish its objective:

Member States. The study will evaluate in particular the fiscal and economic effects of Registration Taxes (RT) and annual circulation taxes (ACT) in a representative number of high, medium and low taxing Member States and will estimate these effects on *National budgets, functioning of Internal Market and on European citizens*"

Three main vehicle related fiscal instruments were studied, namely Registration (Acquisition) Taxes (RT), Annual Circulation Taxes (ACT) and Fuel Taxes, together accounting for most of the vehicle-related tax revenue.

It was understood that the "budget neutrality" concept applied to this study should mean that the sum of the contributions of these three instruments should remain stable, within each State Member.

It was further understood that the criteria used by DG Taxation and Customs Union, based upon the findings of the Background Paper (EC, 1997) as to the division of countries in the three groups of taxation is based on the assessment of registration taxes. Therefore, any measure towards budget neutrality has to do in particular with decreasing registration taxes and increasing annual circulation taxes and eventually, also fuel taxes.

A "a priori" condition was defined by the DG Taxation and Customs Union as to the nature of such approximation. This should be achieved by means of the reduction of Registration Taxes in the high taxation countries, and not through the increase of this tax in the low taxation countries.

Such an approximation should be further analysed by assessing the impact of the current taxation levels at the light of 3 main concerns:

- European Vehicle market
- European citizens
- National budgets

Hence, three main views arise to address this approximation, bearing in mind the budget neutrality condition:

- Reduce Registration taxes and expect that the counter effects on sales volumes outweighs the unit loss
- Reduce Registration taxes and Increase Annual circulation taxes by the amount of the expected loss on tax revenue
- Reduce Registration taxes and Increase both Annual Circulation Taxes and Fuel Taxes, by the amount of the expected loss on tax revenue

1.2. Methodological Organisation of the Study and Structure of the Report

This study has been developed following a sequence of steps envisaging to build up support for final recommendations, with regard to the changes on vehicle taxation within the European Community. Our work is based on the analysis of nine European countries, namely Denmark, Finland, Greece, Ireland, Netherlands, Austria, Germany, Italy and the UK, according with the Terms of Reference for the undertaken study. These countries are meant to be representative of three different taxation groups, Low, Medium and High, after the findings expressed in the Vehicle Taxation Background Paper (EC 1997).

Along this report, these nine countries have been grouped according to their different taxation levels. All the tables and charts appear with similar designs, where countries are aligned as follows:

Table 1 - Countries analysed in each of the three taxation level groups

High Taxation			Average Taxation			Low Taxation		
DK	FIN	EL	IRL	NL	A	D	I	UK

We started by gathering thorough information about the present and recent past conditions (state-of-the-art) in relation with:

- ◆ car ownership and mobility;
- ◆ vehicle fleets and scrappage schemes;
- ◆ vehicle taxation schemes; and their influence on several domains of concern for public policy, like national budgets, internal markets, consumer rights, vehicle fleets and tax avoidance.

This information has been collected mostly from published statistics and some interviews with key informants in the different Member States.

This survey has allowed an adequate representation of the “playing field” and of the main tensions within it. A subsequent chapter is dedicated to a more detailed analysis of these tensions in the domain of economic and social costs, this analysis being based partly on published material, partly on interviews specifically arranged for this purpose.

We then move to the study of impacts of changes of vehicle taxation, starting with the analysis of the intensity of impacts induced by tax changes on car prices, on demand for new and second-hand cars and on age and structure of the vehicle fleets. This is followed by a careful definition of scenarios that may be considered as an adequate and publicly acceptable form of approximation of registration taxes (keeping the budget neutrality constraint active), and then specifying and calibrating the models to assess the impacts of the altered-taxation scenarios on those variables.

This modelling is based on the information collected along this study as well as on a large set of purchased data relative to car sales of several brands and models across the European Union.

In line with this approach, this reports contains 5 sections:

- 1. Introduction (this section)**
- 2. State of the art**
- 3. Impacts of different taxation systems**
- 4. Effects of vehicle taxation changes**
- 5. Conclusions and recommendations**

2 STATE OF THE ART

2.1. Background Information

This chapter provides an overview on the European market, allowing a better understanding on the market characteristics, the economical context and some of its implications. These issues are part of a wider reality, which we believe should be understood in order to estimate the implications of any measure towards fiscal approximation within the European Union context, which is the core of the study undertaken hereby.

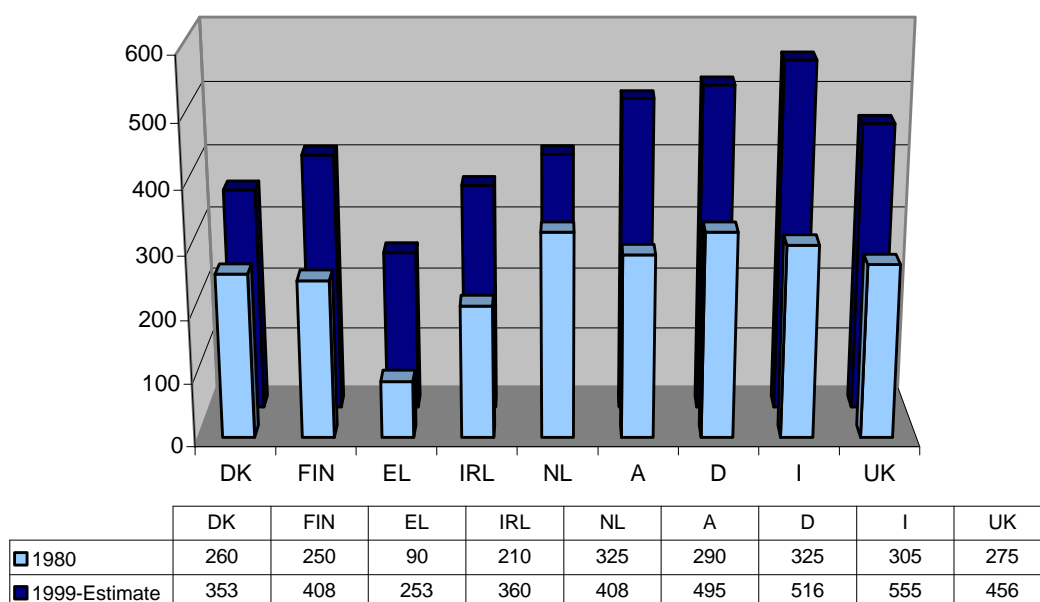
This chapter describes the main variables such as car ownership, composition of vehicle fleets and mobility levels, that traditionally constitute the “application points” of vehicle taxation, and thus must be taken into account when studying variations on this theme.

2.1.1. Car ownership and mobility

This indicator reflects the number of existing registered vehicles in a country, with respect to the population, expressed in terms of cars per 1000 inhabitants. By its nature, it provides a useful tool in the assessment of socio-economic conditions and citizen’s behaviour patterns.

The next chart provides comparison on this indicator for the years between 1980 and 1998 for the countries studied in this report show quite strong increases for all countries in this period.

Figure 1 – Car ownership – Comparison 1980 & 1999

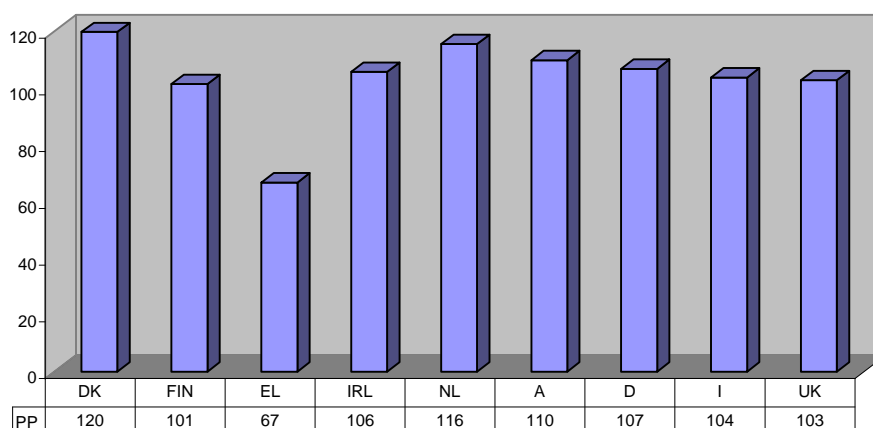


- *In 1999, the European average of car ownership was 422 cars per 1000 inhabitants.*

Source: DG TREN, ACEA

Comparing these values with those of the following two figures, car ownership appears to depend on the level of welfare (purchasing power) in countries as well as on the vehicle’s level of taxation:

Figure 2 – Purchasing Power Index (1999)



For the countries analysed in this report, the following table provides an overview of the car ownership figures for each country since 1990.

Table 2 - Car Ownership per 1000 inhabitants in Europe for different levels of taxation (1990–99)

	HIGH TAXATION			MEDIUM TAXATION			LOW TAXATION		
	DK	FIN	EL	IRL	NL	A	D	I	UK
1990	309	389	171	225	368	388	447	483	361
1991	310	387	173	239	351	403	442	502	396
1992	312	387	184	244	353	418	452	519	399
1993	313	372	193	251	358	428	483	522	404
1994	312	371	204	263	365	437	491	521	410
1995	324	372	215	276	367	448	497	530	417
1996	334	379	214	294	372	459	503	535	425
1997	341	378	229	313	383	470	506	543	436
1998	345	391	245	328	393	482	508	546	446
1999	353	408	253	360	408	495	516	555	456

Source: calculation upon data provided by ACEA and EUROSTAT

In the year 1999, Greece was the country with the lowest car ownership (253), while Italy with 555 vehicles per each 1000 inhabitants was clearly ahead in the context of the nine countries. The following figures allow concluding that the growth in average car ownership was accompanied by some convergence, assessed from the variation coefficient (σ/μ) of the sample.

Table 3 - Car Ownership in the nine countries: averages and variation coefficients in 1991 and 1999

	1991	1999
Average Car Ownership	356	423
Variation Coefficient σ/μ	0.286	0.222

Ireland was the country where the most significant growth in car ownership occurred, up from one of the lowest levels in 1990.

The next table shows the difference of the average annual growth rates for the two time periods, showing a clear slowdown. Except for countries where car ownership has grown from low figures, such as Ireland and Greece with respectively 4.6% and 5.1%, all the others present average annual growth rates below 2.6%.

Table 4 - Car Ownership Average Annual Growth in Europe (80/91 – 91/98)

	DK	FIN	EL	IRL	NL	A	D	I	UK
80-91	1,6%	4,0%	6,1%	1,2%	0,7%	3,0%	2,8%	4,6%	3,4%
91-98	1,5%	0,2%	5,1%	4,6%	1,6%	2,6%	2,0%	1,2%	1,7%

In countries where car ownership was already high in 1991, this “recent years average annual growth rate” tends to be lower than before. Hence, car ownership growth rates seem to be subject a asymptotic trend, meaning that is increasingly difficult to obtain significant marginal increases of car ownership. This can be further related with the concept of vehicle fleet saturation threshold.

Car Ownership and Households

The next table provides the results of household survey developed by DG Transport/Eurostat with regard to car ownership and the underlying reasons behind not having a car, either economical ones or just no will.

It is clear that in the High Taxation countries, an increased number of households admit not to have conditions to afford a vehicle, bringing a new dimension to the analysis of the taxation impacts on the citizens.

Table 5 - Households Survey with respect to Car Ownership

Percentage of households:		DK	FIN	EL	IRL	NL	A	D	I	UK
that cannot afford a car	1996	14,1	10,3	20,9	14,7	6,3	6	15,3	3,5	10,5
	1995	15,1	-	20,2	15,9	6,2	5,9	4,2	3,7	10,3
that don't want a car	1996	23,7	23,4	22,3	16	26,1	20,8	10,7	18,3	17,6
	1995	21,9	-	23	15,5	26,4	21,8	21,3	16,1	16,9
that have at least one car	1996	62,2	66,3	56,8	69,3	67,6	73,2	74	78,2	71,9
	1995	63	-	56,8	68,6	67,4	72,3	74,5	80,2	72,8

Source: Eurostat

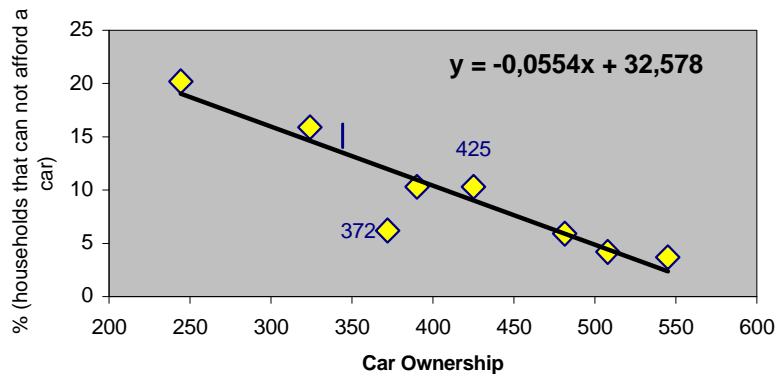
It should be noticed that in Germany there was a significant shift from answers of people declaring not wanting to have a car, to those stating not being able to buy a car, from 1995 to 1996, according to the results of this survey.

Greece, typically a non-producer country, and with some of the lowest living standards in Europe, provides the example of a country where high proportion of households are not able to afford a vehicle. Not incidentally, this effect has been further increased by the systematically high taxation imposed on vehicles.

It was possible to establish a (negative) correlation between car ownership and the percentage of households that cannot afford having a vehicle. The underlying concept is that it might exist a theoretical threshold for demand satisfaction for a correspondent null percentage of households willing to buy a car but that cannot afford such purchase.

The next chart shows the results for this exercise:

Figure 3 - Regression Analysis
Car ownership & Percentage of households that can not afford a car (1996)



The previous chart provides a regressive equation relating both variables. The linearity of the relationship is remarkable, reflecting a high correlation factor of -0,933. Mainly Netherlands, but also the UK, may appear as potential outliers. However, in both situations there is a particular explanation.

- UK (425) shows historically a high share of vehicles in passenger transport (about 89%). This indicates a high preference for private mobility.
- The Netherlands (372) has the highest share of households (26,6%) that do not want to have a car. This share of households seems to decrease the overall stress towards increased car ownership.

However, when assessing the *standardised residuals* for this regression we see that they all fall within the statistic criteria for inclusion.

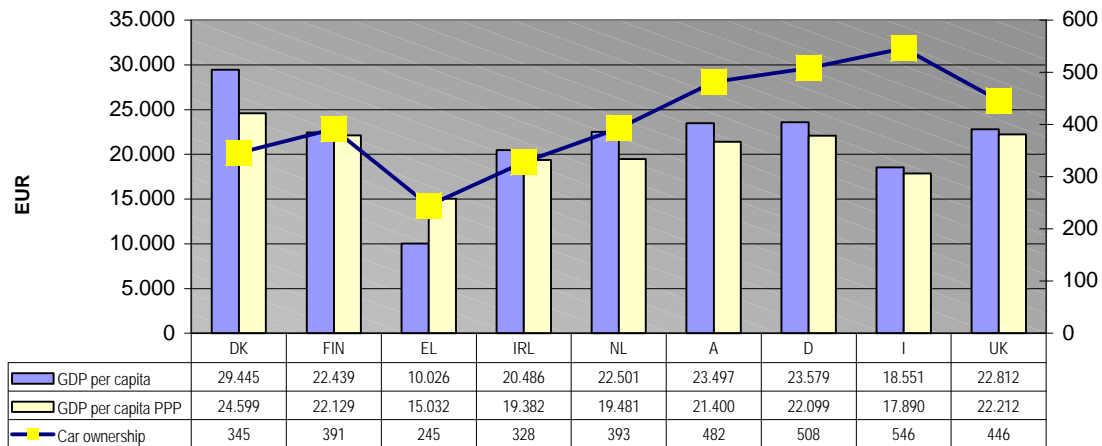
Necessary caution should remain about the fact that we will always find in these countries households that just do not want to own a car. However this share may either decrease or increase, depending upon the modal choices offered. Therefore, this analysis will always have to consider that this floating share exists and is important for forecasting and modelling the market demand in the long run.

Just as an indicative figure, car ownership tends to be as high as approximately 600 vehicles per 1000 capita, which might be interpreted as an average maximum density, at least in the short run. Nevertheless, some regions within Europe present much higher car ownership figures. (A threshold of about 750 vehicles per 1000 capita corresponds to a situation of one car per potential driver above the age of 18, with a small discount for people above that age but with physical or mental limitations). However, situations of more vehicles than number of adults in a household are becoming more frequent.

Car ownership and the Gross Domestic Product

The next chart provides a comparison of car ownership and the Gross Domestic Product (GDP) per capita for the year of 1998. In a cross sectional empirical analysis it is possible to identify what seems to be a close relationship between both indicators. By standardising GDP according to purchasing power parities in each country (GDP PPP), it is possible to flatten the differences of the GDP per capita, better reflecting how car ownership is affected.

Figure 4 - Car Ownership, GDP per capita and GDP PPP (1998)

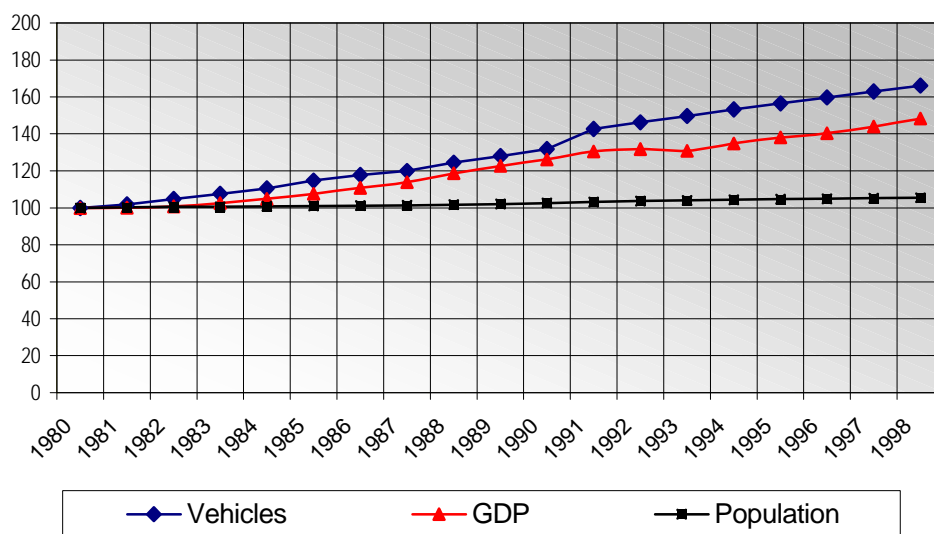


Recent

Evolution

Although car ownership does not seem to have an exact correlation relation with GDP within this set of countries (comparing high taxation countries with the low taxation countries, the latter show to achieve higher car ownership than would correspond to their income levels), the following chart shows however the evidence of at least a strong correlation between car ownership and GDP, and shows furthermore, that there was even a slight shift favouring car ownership, during the last 10 years. Hence, a solid relationship seems to exist between both variables for a longitudinal analysis applied to a given territory (with relatively stable side conditions)

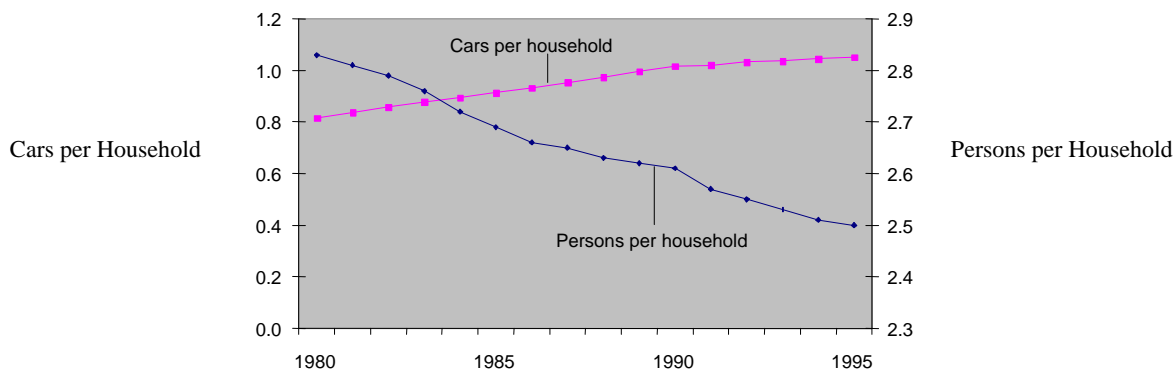
Figure 5 - Indexed Evolution of Car ownership (EU), GDP (EU) and Population(EU) – 1980 > 1998



Source: DG TREN, ETC/AE

Underlying the dramatic increase in car ownership in the last decades is the increasing number of cars per each household, at the average annual growth rate of 2.5 %, despite the decreasing number of persons per household¹. In fact, the latter implies the development of new households, which is an important unit in assessing vehicle ownership, as each household develops its own transportation needs.

Figure 6 - Evolution of the average number of cars per household and the number of persons per households in the EU, 1980-1995



Source: DG TREN, EEA (2000)

Both these developments are further stimulated by a growing income, increases in average travel distance, decreased accessibility by public transport or changes in lifestyle. The strong growth seems to be now slowing down in countries that already have relatively high car ownership (Austria, Germany, Italy and UK), which is in line with the findings from the previous section.

This slower growth can objectively be explained by the fact that households generally don't need more than one or two cars. After reaching this threshold, it becomes increasingly difficult to promote further growth of car ownership. The next table shows (for some of the countries included in this study), that the share of vehicles in passengers' mobility has remained very stable over the last decade. Greece is the exception, as it has had some growth, contrary to the other countries. This growth from 66% to 69% can be explained by the economic backlog that it is catching up.

Table 6- Share of vehicles in passenger Transport

	DK	FIN	EL	IRL	NL	A	D	I	UK
1990		78%	66%	77%	79%		83%	75%	88%
1995		79%	68%	78%	79%		83%	76%	89%
2000		80%	69%	79%	79%		83%	76%	89%

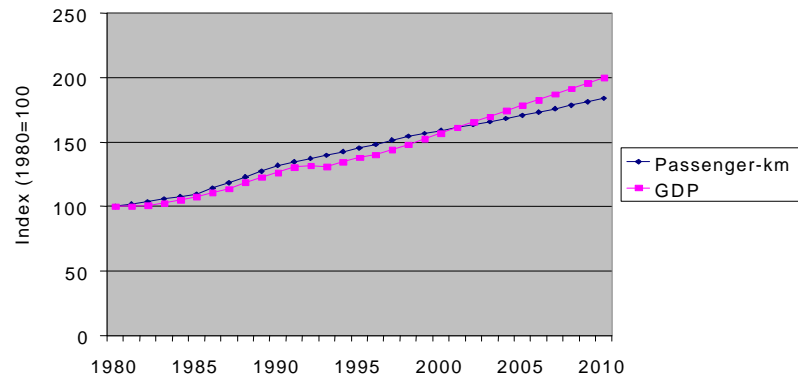
Source: Auto Oil II- Cost Effectiveness Study

Mobility

Mobility can be strongly correlated with car ownership, with Gross Domestic Product being one of the parameters influencing mobility in the long run. The chart below provides the recent coupled evolution for the last two decades. Even if there could have been small changes of the average number of passengers per car – probably reductions, accompanying the reduction of household size – the underlying association between vehicle.km (which is the “point of application” of fuel taxes) and GDP certainly is very strong.

¹ Source: EUROSTAT

Figure 7 - Evolution of Mobility (pass.km) and GDP (EU-15), 1980 and 2010



Source: Eurostat, 2001; EEA, 2000

2.1.2. Passenger vehicles fleet

Dimension

Being directly connected to the previous indicator “car ownership”, the absolute dimension provides information about the absolute number of vehicles involved and thus the importance of each market.

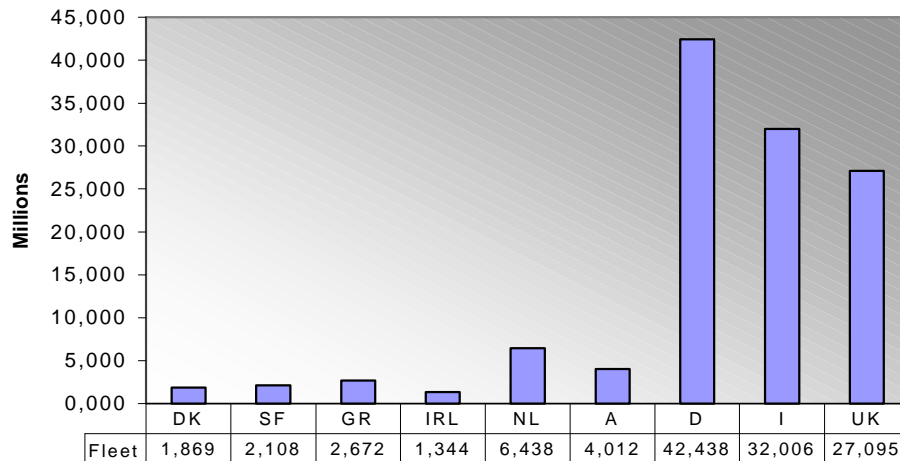
Table 7- Fleet Dimension (Thousands) 1991- 1999

	DK	FIN	EL	IRL	NL	A	D	I	UK
1991	1,594	1,923	1,749	0,837	5,224	3,100	35,003	28,435	22,744
1992	1,604	1,936	1,881	0,858	5,297	3,245	36,042	29,430	23,008
1993	1,618	1,873	1,991	0,891	5,411	3,368	38,772	29,652	23,402
1994	1,617	1,873	2,111	0,939	5,558	3,480	39,765	29,665	23,832
1995	1,685	1,888	2,240	0,990	5,633	3,594	40,404	30,301	24,307
1996	1,744	1,930	2,240	1,057	5,740	3,691	40,988	30,624	24,865
1997	1,788	1,935	2,401	1,134	5,931	3,783	41,372	31,107	25,594
1998	1,822	2,008	2,568	1,197	6,120	3,887	41,674	31,371	26,269
1999	1,869	2,108	2,672	1,344	6,438	4,012	42,438	32,006	27,095

Source: ACEA

The next chart provides an overview for the year 1999. The huge differences are reflecting the compounded effect of car ownership and total population. The importance of the 3 markets here representing low taxation countries (D, IT, UK) is remarkable. These are also some of the most relevant car (passenger vehicle) producer countries in Europe.

Figure 8 - Passenger Vehicles Fleet (millions) - 1999



An obvious conclusion is that these markets represent the main concern from the producers, implying that any fiscal change regarding the vehicle markets there would have to be carefully assessed.

As discussed below, these countries do not apply registration taxes at all or, like Italy, only apply quite low taxes.

Composition (by Type of Fuel)

Passenger vehicles can be further characterised according to the type of fuel used. Petrol (unleaded) and Diesel remain the most important sources of energy used in the vehicles. Petrol vehicles have been accounting for the largest share of the overall fleet.

The main reason underlying this trend is the need for bigger and more expensive engines associated to the use of Diesel, in comparison with petrol vehicles, for the same power output, which was reflected in the retail prices of the diesel vehicles. Even considering that diesel oil is generally less expensive than petrol, for a private owner with low average annual mileage, the return of the additional investment on acquisition does not compensate within the lifetime of the vehicle. Moreover, as discussed in further sections, the taxes on acquisition sometimes penalise engine's capacity, which has been an additional constraint to the broader use of diesel vehicles. However diesel technology has been improving and it is now possible to acquire diesel vehicles with very similar characteristics to petrol vehicles, hence with significant price similarity, some times even outweighing petrol vehicle's performance.

These technological improvements have further boosted the superior energetic efficiency associated with diesel engines. This, together with fiscal policies traditionally lightening the tax burden on diesel (partially due to the fact that diesel is the fuel used by essential economic activities such as haulage and public transports), has resulted in increasing the shift from petrol vehicles to diesel vehicles across the European market.

The next table provides the statistics about this recent evolution:

Table 8- Diesel Share of Passenger Car Stocks

	DK	FIN	EL	IRL	NL	A	D	I	UK
1994	3%	5%	2%	17%	12%	40%	17%	9%	23%
1995	3%	7%	3%	16%	14%	43%	15%	11%	21%
1996	3%	14%	2%	13%	15%	50%	15%	17%	18%
1997	3%	15%	2%	11%	17%	54%	15%	17%	16%
1998	4%	15%	1%	12%	20%	54%	18%	22%	15%
1999	5%	17%	1%	13%	22%	57%	19%	23%	15%

Source: LMC Forecasts

With very few exceptions, the countries studied show important increases in the share of diesel vehicles. In Austria there is a significant trend towards diesel cars. One of the underlying reasons is that the taxation system is providing incentive to buy cars with low fuel consumption². As a result, the share of diesel-driven vehicle on total car demand has increased from around 20% in the early 90's, to more than 50% of new registered cars in 1999.

With respect to this, there are already some signs in Europe that fuel consumption is partially shifting from petrol to diesel, which may have in a near future a significant influence in the fuel taxation policy followed by most countries with regard to diesel.

Company Vehicles

Company vehicles are vehicles that are registered in the name of an employing company and allocated to permanent use by one of its employees, typically an executive. As this constitutes a benefit in kind, most countries apply some kind of revenue tax on the estimated value of this benefit, but great differences exist in this respect.

Even if this is not a form of vehicle taxation (but rather of personal revenue taxation), the extent of the fiscal benefit may have a significant influence on several aspects of the vehicle markets:

- Increasing total fleet size, as even if the salary of the beneficiary would be enough for owning a car, getting one included in the payback package facilitates use of household revenue for owning another car;

² The acquisition tax rate is based on the car's fuel consumption reduced by 2 litres for petrol cars and 3 litres for diesel cars, respectively. The adjusted consumption is multiplied by the factor 0.02 in order to reach the total tax rate

- Promoting stronger new vehicle sales, as these vehicles are also used for representation purposes and tend to be no more than three years old in the hands of the original owner;
- Lowering the prices for second hand cars, as the market is regularly flooded by waves of three year old cars, in many cases with relatively low mileages.

Therefore, despite the fact that this issue is not of direct concern in this study, we have tried to obtain the relevant data on the size of this component in the total vehicle market in each country, as this might explain some of the variations in the three above mentioned dimensions. Unfortunately, even if there are some countries for which this information is available in rough percentage terms, we have not been able to obtain similar data for all the countries in our set. The incomplete available information is, however, hereunder presented for three of the Member States studied.

Netherlands³

In 1991 less than one-third of new vehicles purchased were company cars, but by 1997 it had risen to about 39%. At the same time the corporate share of the car fleet has declined, and the average replacement cycle for company cars has declined slightly to about 40 months. Corporate cars currently holds about 10% of the total car park.

Finland⁴

Around 35-40% of all new cars in Finland is purchased by companies or other societies like government organisations or municipalities. About 60% of these cars are company cars used by employees.

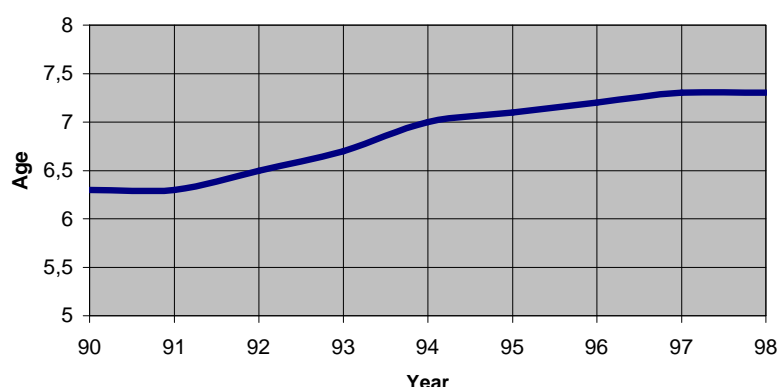
United Kingdom⁵

In 1989 13 % of all registered cars were company cars. This number had decreased to 10.3 % in 1997, however the proportion of newly registered cars, which are company cars, remains at slightly over 50 %

³ Source: www.yahoo-finance.com

⁴ Source: www.yahoo-finance.com

⁵ Source: Country Report

Average Age of Vehicle Fleets**Figure 9 - Average age of the European Vehicle Fleets**

Source: Eurostat, 2001

As shown in this previous chart, the average age of passenger cars has increased from about 6.3 years in 1990 to near 7.3 years in 1998, showing a clear trend towards an ageing fleet.

This development can be explained by the fact that new cars are bought, but old cars are kept active, which may be explained mainly by two types of behaviour, both based in the relatively low market prices for used cars:

- When the first household car reaches the age for substitution, when confronted with low offers in the market (increasingly even when trading-in for a new car), keeping it as a second car in the household is frequently seen as the economically soundest choice;
- The availability of older, cheaper cars make the “dream” of car ownership possible to many lower revenue people.

On the other hand, technological improvements introduced by the industry and the existence of compulsory periodic vehicle inspections might also be contributing to this trend through increased durability of vehicles in relatively good mechanical conditions.

The following table presents the average age of vehicles for the nine European countries.

Table 9 – Average Age of Vehicles ⁶

	DK	FIN	EL	IRL	NL	A	D	I	UK
1990	7,8	6,9	10,1	6,2	5,9	6,5	6,1	7,4	5,3
1991	8,0	7,4	9,6	6,2	6,0	6,4	8,0	7,3	5,3
1992	8,3	8,1	9,0	6,4	6,1	6,4	7,4	7,4	5,6
1993	8,6	8,3	8,9	6,6	6,4	6,5	6,9	7,7	5,7
1994	8,3	8,7	9,3	6,6	6,6	6,6	6,9	7,9	5,8
1995	8,3	9,1	9,4	6,6	6,8	6,8	6,8	8,1	5,9
1996	8,3	9,5	9,5	6,1	6,9	6,8	6,7	8,3	6,1
1997	8,2	9,6	-	5,5	7,0	7,0	6,7	8,2	6,1

Source: EUROSTAT

The average age of the passenger cars in Europe varies widely among countries. One of the highest average age of vehicles can be found in Greece which might be related to the general economic conditions, while the higher ages in Finland (currently nearly 10 years) are probably a consequence of the period of economic recession in this country during the 1990s, reflected in a significant decrease in demand for new cars, with an impact on the average age of the fleet. Anyway, in general the high taxation countries show an older fleet than the others.

⁶ No reliable source could be found regarding the years 1998 and 1999, with respect to this variable.

A special remark should be made with regard to the vehicle's age in Italy, which is considerably higher than the average, despite the privileged fiscal situation, as we will see, and the fact of being supported by a strong car industry.

An analysis of the distribution of vehicle ages was not possible to make. However a proxy indicator for this assessment can be built upon consumption of leaded and unleaded petrol. While this ratio is currently almost 0 (zero) for most European countries, meaning that most of the countries have been updating their fleet, in Italy this ratio in 1997 was still above 1 (one), meaning that the consumption of both types of petrol was similar in that recent year. This could be a good indication for a widely spread age structure, since most of the vehicles produced after 1992 were already equipped with catalytic converters for unleaded petrol, envisaging to fulfil the Euro norms.

2.1.3. Scrappage schemes and their influence

From time to time, countries implement so-called scrappage schemes, generally in connection with a set of other measures to boost economic activity or simply to improve car fleet characteristics.

These incentives imply the scrappage of an old car (typically over 10 years old) in exchange for a new one and are usually aiming in several directions:

- *Economic, by increasing new vehicles sales;*
- *Environmental, by promoting environmental purges (scrap old and polluting vehicles);*
- *Traffic Safety, as newer cars are likely to be safer.*

Although not always clear whether they meet their objectives, it is acceptable to say that they have to some extent a positive influence.

Some European countries offered in the last decade such incentive, envisaging to foster vehicle fleet renewal, to cope with the agreed Euro norms, imposing progressive limits to vehicle emissions. However, at least in Italy, as will be shown below, the aim was to boost vehicle sales after a period of recession in the vehicle market.

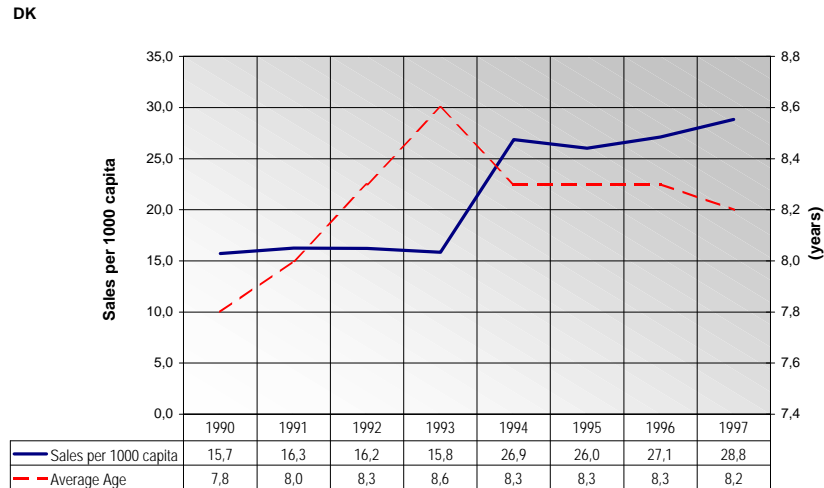
The qualitative effects on new vehicles sales arising from scrappage schemes that have been applied in Denmark (1994-95), Greece (operational in 1991-93), Ireland (1995-97) and Italy (1997-98) are further⁷ discussed. It should be noticed that the existence of a scrappage scheme in a country is reflected in the end of the period of its introduction. In this next case the existence of such incentive in 1994 had the clear effect of an increase in sales from 1993 to 1994, the year in which the scheme was applied.

⁷ ECMT, 1999

- Denmark

According to this chart, scrappage incentives in Denmark – active in 1994-95 - seem to be closely related to the increased number of new vehicles purchased in that period, thus enabling the conclusion that scrappage incentives (replacing old by new) were the prevailing driver to the decrease of the average age of vehicles.

Figure 10 – Scrappage Incentives in Denmark

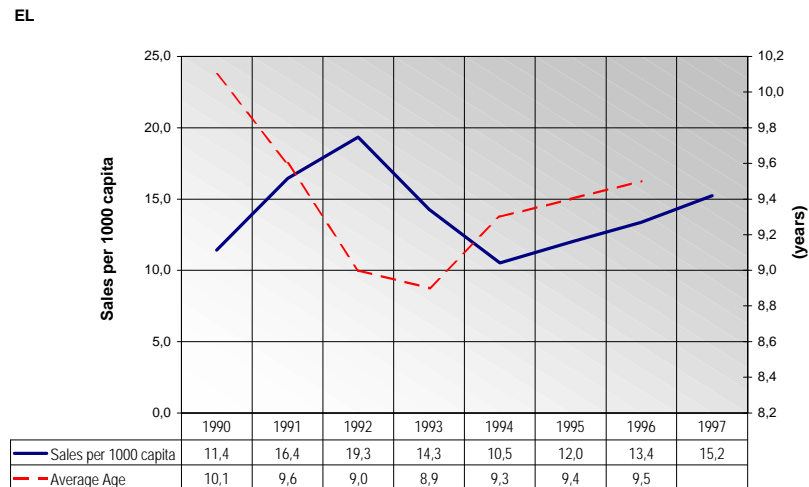


- Greece

According to the chart, the impacts of the scrappage schemes - active in 1991-93 - are not very clear. In fact the period between 1990 and 1992 is characterised by a significant increase of new vehicles sales. This is then followed by an abrupt decrease from 1992 to 1993, and even more in 1994.

The average age of vehicles decreased during this period, from slightly above 10 years in 1990 to near 8 year in 1993. This provides some degree of evidence of what seems to be a positive impact of car scrappage incentives on the average age of vehicles.

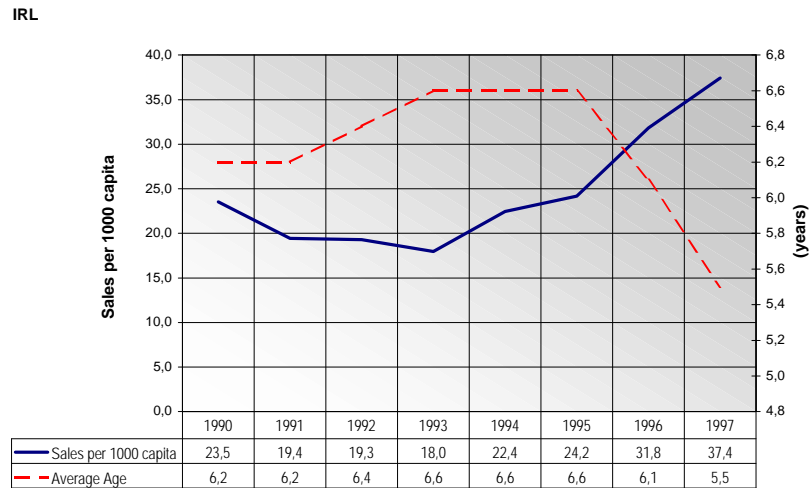
Figure 11 – Scrappage Incentives in Greece



• Ireland

The scrappage incentives in Ireland - active in 1995-97 - seem to be justifying the increased number of new vehicle purchases. The decrease on the average age was, therefore, also driven by the scrappage incentive, according to the available information.

Figure 12 – Scrappage Incentives in Ireland



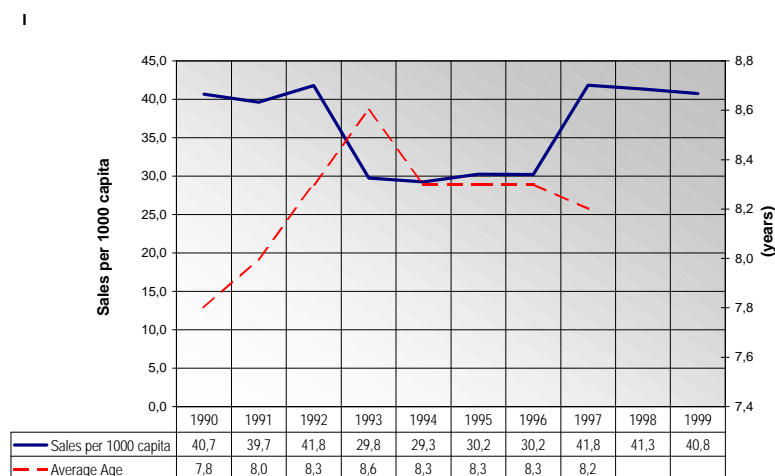
• Italy

The Italian vehicle market has been at odds with the rest of Europe throughout the 1990s. During the early part of the decade demand was strong. However, in 1993 and 1994 sales fell to their lowest level for over ten years. This did not improve during 1995 and 1996.

The government stepped in and introduced an incentive scheme – active in 1997-98 – that was more than matched by additional incentives from the vehicle manufacturers. Within the first year of the scheme approximately 2 million vehicles were scrapped. Sales of new cars increased from 1,732,200 in 1996 to a record of 2,411,900 the next year, a rise of 39%. The average age of the fleet, decreased from 8.3 to near 8.2 years in 1997.

Because of its success, the incentive was continued, on a more limited scale until the middle of 1998. The 1999 figure indicates a decline in new car sales.

Figure 13 – Scrappage Incentives in Italy



Main conclusions on Background information relevant for vehicle taxation

- Car ownership has been increasing throughout the years in all European countries analysed. However, countries showing higher car ownership at the start of the analysed period tend to show a smaller marginal growth apparently related to the concept of market saturation.
- The countries belonging to the Low Taxation Group (D, I, UK) tend to have higher car ownership.
- So far, the maximum threshold for private vehicle ownership seems to be about 600 per 1000 inhabitants for the European countries. However this estimate can be raised to near 750, by demographic considerations about all the constraints involved.
- Mobility volumes have been increasing in line with GDP.
- GDP growth might be considered as a proxy to evaluate car ownership increases, within the boundaries of the time period analysed (1991-1999) in the European Union.
- Each European vehicle market reflects the dimension of the country. Thus, most of the overall European Market is concentrated within a few large countries
- Most of the passenger vehicle fleet runs on unleaded petrol. However there is a recent trend towards diesel technology, which is driving a change in the typical composition of the fleet. This could be further simulated by the relatively low prices of diesel.
- Average age of vehicles seems to be depending on taxation group, with the only exception of Italy in the group of 9 countries analysed. However there is still no clear evidence of the reasons for that.
- The average age of European fleets has been increasing throughout the last decade. Factors like keeping up vehicles, associated with the increased number of households with two vehicles, seems to be underlying this trend.
- It seems to be logically admissible that scrappage schemes induce mostly positive effects or at least non-negative ones;
- A wide gap between scrappage incentives and price of new vehicle exists. This gap is likely to hinder most people owning old vehicles from fully seizing these opportunities, particularly when it is very admissible that most people keeping their vehicles until those ages are also not able to afford the remaining value for the price of a new vehicle. Therefore, a change on the underlying conditions of scrappage schemes could include the admission of scrappage of an old vehicle and exchange for a used one, with a certain maximum age, which would require much less differential costs, considering the depreciation of the used vehicles. This would still have an indirect effect on new vehicle sales, since the seller of the used (not so old) vehicle would probably upgrade for a younger (or even new) car.

2.2. Characterisation of vehicle taxation systems

2.2.1. Theoretical background and policy context

Vehicle related taxes are widely spread over a set of taxes and charges, the balance between them being dependent on each country's political and economical choices. This determines the existence of an inner dimension for taxation changes, through the rebalance of these vehicle-related taxes, while significant differences on the base price levels, retail prices and taxation burden levels play important roles in the European market equilibrium.

Characterisation of Taxes

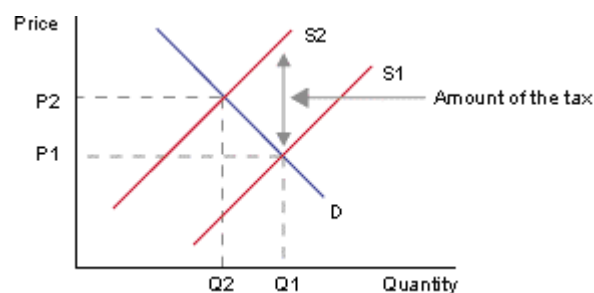
While direct taxes are taxes on income, indirect taxes are taxes on expenditure. In the specific case of vehicles, this includes VAT on acquisition and on fuel, fuel duties, registration taxes and circulation taxes.

There are two main types of indirect taxes levied on vehicles:

- **per-unit** - charged as a fixed amount on each unit of the good
- **ad-valorem** - charged as a percentage of the base value of the good or service.

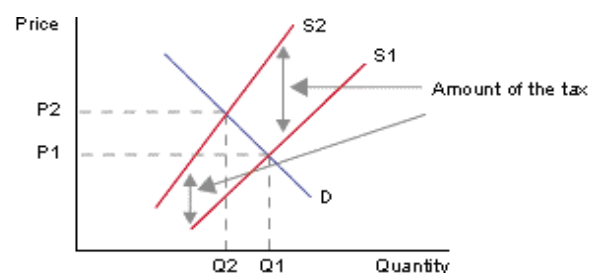
The effect on the market equilibrium will be slightly different for each of these two types of tax. In the case of **per-unit tax**, that is the kind of tax applying in the acquisition related, for instance, with engine capacity, this will be paid to the government by the consumer, having an impact in the demanded quantities, thus the industry sales. This will therefore shift the industry's supply curve. In order to keep the same level of supply, compensatory measures will be needed over price to overcome tax effect. However, the existing VAT (ad-valorem) imposes a step further on this analysis, with a significant impact on the vehicle market (see next figure).

Figure 14 - Market Equilibrium for a per-unit tax



For an **ad-valorem tax**, like the VAT or others that may apply on vehicles, the principles are quite the same but the effects slightly different. The tax will still shift the supply curve upwards, as the industry will ask for a higher price to compensate their levels of supply. However, because the tax is a percentage of the value of the vehicle it will be shifted by different amounts according to the base price. The effect of this on the supply curve (S) is shown in the diagram below:

Figure 15 - Market Equilibrium for an ad-valorem tax



The impact on the equilibrium price and quantity therefore depends on the amount of the tax and on the original price level.

The burden of an indirect tax is thus very important, and will vary according to the elasticity of demand for the product it is imposed on. If the demand for the good is very **elastic** (very responsive to price changes), even if prices do not increase very much when the tax is imposed, the quantity will fall significantly. If the demand for the good is perfectly inelastic, then all the tax passes through as a price increase and quantities do not change.

In reality the vehicle demand is neither fully elastic nor inelastic. So the industry shares these costs with the consumer.

Compounding these two impacts reveals the industry behaviour in Europe. In fact, the industry strategic approach can have **two different levels of optimisation**, as to minimising the shared taxation burden, which are:

1. Adapt the vehicle model for specifications, partially tackling the per-unit tax.
2. Varying the base price for these vehicles, partially tackling the ad-valorem tax.

As to the latter, the industry takes an active part on this equilibrium, shifting its base prices, based upon a legal framework⁸ allowing a high degree of freedom with respect to these procedures, as we will see in the following sections.

Vehicle Taxation Policy

Within the internal market, only a limited degree of fiscal harmonisation on vehicles took place up to now. Luxury VAT rates were abolished, and tax on goods and services (including motor vehicles) which involved cross-border formalities for intra-community trade were prohibited. Despite these measures, Member States retained and used the right to maintain and/or introduce taxes on goods and services, which did not include cross-border formalities. The luxury VAT rate usually charged on vehicles was replaced by a number of taxes, fees and charges on motor vehicles, with the aim of maintaining the previous level of revenue for the State. Without exception, all Member States heavily rely on a range of instruments to ensure important budgetary revenues from both private and commercial road users. The way Member States use the set of available fiscal instruments reflects a variety of influences beyond the obvious need to raise revenue. Considerations on geographic, industrial, social, environmental, energy and transport policy issues have a considerable weight on the type of fiscal approach followed. The way those influences are mirrored in the overall strategies of the governments, has traditionally led to large differences in the adopted policies. These policies have been rather stable in each country, and there is no sign of changes of vehicle taxation strategy induced by the creation of the European Single Market.

Nowadays, the existence of an increased environmental awareness is stressing the need for more structured fiscal policies. Also from an environmental point of view, the slow progress made towards an European approximation of vehicle taxation is delaying a common understanding on the fiscal measures to induce achievement of commitments, such as the Kyoto's protocol.

Company Vehicles

Company cars that are available for private use is generally considered a personal benefit and are therefore subject to taxation. The reasoning behind subjecting the private use of company cars to taxation is that it represents a *private* benefit and the tax burden should therefore be related to private usage. However, the fiscal approach to this situation differs among the European countries.

Therefore, the impact on the market arising from this fiscal treatment might be significant; to the extent that an increased number of new vehicles bought by companies each year is probably underlying increased car demand. These impacts should be confronted with those arising from taxation levels, particularly in countries where this situation tends to be a common practice.

⁸ See section "3.1 - The functioning of the internal market"

Table 10 – Company Vehicles (Fiscal Approach)

COUNTRY	FISCAL TREATMENT	RATED AT	VAT DEDUCTION
DK	Benefit-in-kind	25% value/year	Not allowed
FIN	Benefit-in-kind	Companies may cover costs and users freely use car. Otherwise user must pay at least fuel costs	Only if exclusively used for business purposes
EL	N/A	-	-
IRL	Benefit-in-kind	30% value/year - increased if more than 15.000 miles a year for private use	Not allowed
NL	Benefit-in-kind	20% value/year - related to commuting distance Exception when proved less than 1000 km for private use	Not allowed
A	Benefit-in-kind	1,5% car value/month + 3,65ATS per km until 7,000ATS/month	Allowed
D	Benefit-in-kind	1% value + DM 0,52/km for commuting	Partially allowed
I	Benefit-in-kind	Estimation of private mileage	Not allowed
UK	Benefit-in-kind	35% value/year, if less than 4 years old One third less if more than 4 years old	Not allowed

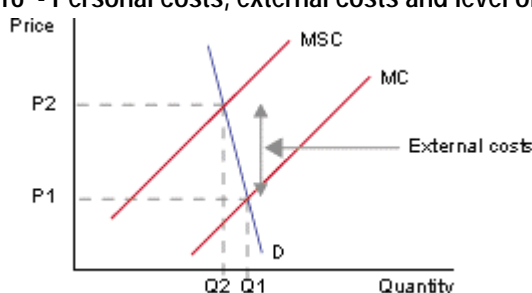
Source: Fair And Efficient Pricing In Transport – The Role Of Charges And Taxes - European Commission DG TREN EC DG TAXUD and EC DG ENV

Environmental Taxes

External costs or negative externalities arising from vehicle usage are becoming increasingly important. Thus, this analysis of Vehicle Taxation as a cost internalisation tool is particularly relevant to the extent that the environmental concerns are driving political decisions.

The external costs of people’s actions are often not taken into account by those people when they consume products and so they will regard the good as cheaper than it really is. That is, the private cost of car use to an individual is the financial cost - acquisition and wear and tear. However, there are further costs to society. Because people do not take these costs into account, they may over-consume the product (here not only the car itself but also its utilisation, i.e. mobility), because it is seen as cheaper than it really is. This is shown in the diagram below:

Figure 16 - Personal costs, external costs and level of consumption



The private cost of car use is represented by the MC (average cost) curve. If people take account of just these costs then they will consume Q1. However, as discussed above, there are further costs - external costs - and these are shown by the gap between the MC curve and the MSC curve. The MSC (marginal social cost) curve includes all costs. On the basis of all these costs, people should only consume Q2

To try to cope with this problem and ensure that the usage level of the vehicles does not exceed a certain level, that could endanger the development of strategies with regard to environment and transport policies, governments chooses to introduce tax schemes on vehicle usage. The excise duties on motor fuel are seen as the best available fiscal tool to reduce the amount of diesel and petrol used.

These taxes can be arranged to be close to the average value of the external costs and will then increase the price by the required amount and, hopefully, ensure a correct usage level (Q2 in the diagram above). The main problem for the governments is accurately assessing the value of the external costs and therefore setting the value of the tax appropriately, besides the fact that this instrument is unable to relate to site or time specific externalities, which have to be treated with other instruments.

Fuel taxes are differentiated envisaging to promote 'cleaner' fuels such as unleaded petrol (in the past) of low-sulphur diesel (at present). The aim is to promote low or ultra low sulphur fuels to comply with the EU standards of Directive 98/69 for the year 2005. This should help to reduce NO_x, PM₁₀, and CO₂, at the price of extra refinery emissions and costs.

Fuel tax is the only pricing instrument *used throughout the EU* that is related to vehicle usage. Road pricing schemes are also related to vehicle usage, but up to date their application is limited to motorways in some Southern European countries (e.g. Italy) and to very specific road parts in some urban areas.

Therefore fuel taxes are seen as the most efficient instrument currently available for internalising social costs linked to the use of vehicles, such as infrastructure costs, accident costs and air pollution costs.

2.2.2. Taxation structures

The following table provides an overview on the characterisation of vehicle taxation structure, highlighting the three broad categories in which the tax instruments apply to vehicles:

Table 11 - Vehicle Related Taxes⁹

		HIGH TAXATION			MEDIUM TAXATION			LOW TAXATION		
		DK	FIN	EL	IRL	NL	A	D	I	UK
TAXES ON ACQUISITION	VAT (%)	25.0	22.0	18.0	21.0	19.0	20.0	16.0	20.0	17.5
	Registration Tax (RT)	●	●	●	●	●	●		●	
	Registration Fee	●						●	●	●
TAXES ON OWNERSHIP	Annual Circulation Tax (ACT)	●	●	●	●	●	●	●	●	●
TAXES ON MOTORING	Excise duty on fuels + vat	●	●	●	●	●	●	●	●	●
	Tolls on roads or bridges			●			●	●	●	●
	Euro-vignette system	●					●	●		

⁹ EC DG Taxation and Customs Union - Doc/2206/2000 – En / Vat Rates Applied in the Member States of the European Community - Situation as of 1st Mai 2000

TAXES ON ACQUISITION

- **VAT**

All Member States levy VAT on acquisition of new vehicles according to the European Community VAT regime. The rates levied vary between 16 and 25%. The highest rates are applied in Denmark, Sweden and Finland, with an increased consequence on the vehicle prices, compounded with the already high registration taxes.

- **Registration Tax**

Registration taxes are levied in ten Member States. Others like Germany and United Kingdom do not apply this kind of tax at all, except a small registration fee. These taxes are either related to the base price of the vehicle, engine capacity, engine power, weight, fuel specific consumption, emissions standards or to a mix of all these factors. The simpler situation is strictly based on vehicle base price (ad-valorem taxes), as in Denmark, whereas in others, like Austria, the tax amount is dependent not only on the value of the vehicle but also on the average fuel consumption.

This difference reflects the concern for the environmental consequences of vehicle usage. Vehicles with low emissions may benefit from a reduction in the registration tax. However, most of the Member States levy registration tax according to the engine capacity only. This tax is usually applied per unit, sometimes increasing dramatically as the engine capacity increases. Besides raising revenues, the underlying reason for such taxes are either environmental concerns (since the engine size can be directly related to the specific fuel consumption), or to control macroeconomic variables, like overall consumption. However this situation might have discriminatory effects on the citizens, preventing the access to upper vehicle classes. This situation is likely to have a particular impact on diesel vehicles, which demand higher engine capacities in comparison with petrol vehicles.

Registration taxes are levied when the first registration is made in the national vehicle register, Italy being an exception, since the low registration tax here is also levied on each change of ownership.

Table 12- Registration Taxes Applied to Passenger Vehicles

	DK	FIN	EL		IRL	NL	A	D	I	UK
Type of Tax	Registration Tax	Registration Tax	Special consumption tax	Registration Tax	Registration Tax	Registration Tax	Registration Tax		Registration Tax	
Basis of Charge	Retail price: 105% of first DKr 50 800, 180% of balance	Value of the vehicle at customs	Combination of value and engine capacity	Vehicle price	Retail price and engine capacity	Net list price	Value and fuel specific consumption		Horsepower (also on each change of ownership)	

SOURCE: Inventory of Taxes, Country Reports

Registration taxes tend to be focused on passenger cars, and Member States that levy such taxes tend to apply reduced rates or exemptions for vehicles with commercial purposes, such as buses and freight transport.

- EXEMPTION REGIMES

Table 13- Registration Taxes Exemptions

Country	Detail
Denmark	Commercial goods lorries and goods vans with a permitted total weight exceeding; Four tonnes; buses and tractors; bicycles with an auxiliary motor (mopeds); electrical vans. Motor caravans exceeding two tonnes permitted total. In the case of passenger cars for transportation of sick persons, taxis and hackney carriages the tax amounts to 20 % of the vehicles selling price excluding the Tax, and DKK 12 100.
Finland	The following vehicles, <i>inter alia</i> , are exempt: fire engines, ambulances and lorries, mobile homes with unladen weight of at least 1 875 kg, cars used by foreign diplomatic missions and consular posts headed by career consular officers, as well as members of their personnel who are not Finnish nationals, three-wheeled delivery cycles, cycles for disabled people and mopeds.
Greece	On new taxis using anti-pollution technology, a special reduced rate of 15 % of the special excise duty on corresponding passenger vehicles, for private use has been applicable since 1 January 1997 (Law No 2459/97). Sub-paragraph (b) of the same section was repealed by Law No 2459/97 with effect from 1 January 1997. Competition vehicles which are suitable and are used only for competition driving (Article 10 of Law No 1573/1985).
Ireland	<ol style="list-style-type: none"> Special purpose vehicles not intended for use in a public place or vehicles designed and constructed for off-road use (except racing vehicles, scrambling and other sporting vehicles). Category D vehicles, namely an invalid carriage, refuse carts, sweeping machines, watering machines used exclusively for cleaning public streets and roads, ambulances, road rollers, fire engines, fire-escapes, vehicles used exclusively for the transport (whether by carriage or traction) of road construction machinery, used only for the construction or repair of roads and vehicles used exclusively for the transport (whether by carriage or traction) of life boats and their gear or any equipment for the affording of assistance in the preservation of life and property in cases of shipwreck or distress at sea. Subject to certain conditions and restrictions vehicles in the following situations are exempt: in connection with a transfer of normal residence; in connection with a transfer of a business undertaking; following acquisition by inheritance; gifts, donations from approved official bodies, public authorities or groups outside the State to similar groups, etc., in the State; official use by institutions of the European Communities and the European Foundation for the Improvement of Living and Working Conditions and personal use for officials and staff of these institutions who transfer residence to the State; under diplomatic, consular, or similar arrangements; in the establishment or maintenance of an international air service using a State airport, the establishment or maintenance of radio or meteorological services ancillary to such service and when used for experimental purposes in connection with the establishment and maintenance of such international air service. A vehicle which is brought temporarily into the State. <p>Note: while the above vehicles are exempt from payment of tax, registration is required in most instances.</p>
Netherlands	<p>New vehicles exported by an entrepreneur.</p> <p>New vehicles seating more than eight passengers.</p> <p>Special vehicles for the transport of sick persons or prisoners.</p> <p>Police vehicles, military vehicles and fire-engines.</p> <p>Motor tricycles for disabled persons.</p>
Austria	Exemptions include police vehicles, fire engines, ambulances, military vehicles, buses, cars attached to rail-borne vehicles, and motor vehicles with foreign registration plates where there are reciprocal arrangements.
Germany	N/A
Italy	Certain types of motor vehicles used for public services are exempt.; Vehicles imported temporarily are exempt for a limited period; disabled people.
UK	N/A

Source: Inventory of Taxes – European Community / Country Reports

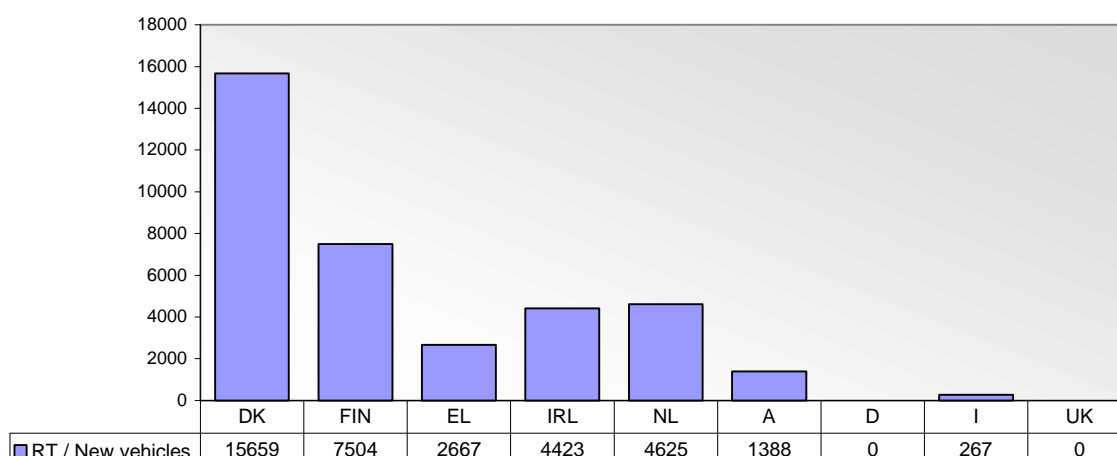
Level of Registration Taxes

As to the levels of taxation, these vary considerably among Member States. The highest average levels of registration taxation can be in found in Denmark, Finland, and Ireland¹⁰.

It is remarkable how the Member States with a large car production industry (Italy, Germany and UK) tend to have lower registration taxes or no taxes at all. This conclusion is drawn from the next chart where we can clearly see the proportion of registration taxes per vehicle for the 9 countries being studied, in which some of the producer countries are appearing showing null tax raising on this issue. This ratio can be understood as an indicator for taxation burden.

¹⁰ European Commission, 1997a

Figure 17 – Average Registration Tax Amount per New Vehicle (Euros) – 1999



Source: ACEA, OECD, EUROSTAT

Except for VAT, these countries do not rely at all on acquisition taxes to raise revenue. Again, it is also remarkable that in those countries with the highest taxes on new cars, Denmark, Finland and Greece there are relatively (EU comparison) lower levels of car ownership.

TAXES ON OWNERSHIP

These taxes are due in connection with possession or ownership of a vehicle, such as circulation taxes, and are levied in all Member States, both on passenger cars and commercial vehicles. An overview of the circulation taxes and the basis for the tax is given in the following table.

On passenger cars they are normally related to factors such as engine power, vehicle weight and age, energy consumption, fuel type and district of registration, amongst others.

Although these taxes are generally small in relation to the total annual costs of ownership and use of a car (depreciation, insurance, maintenance and running costs), they may have some influence on car ownership.

Table 14- Circulation Taxes Levied on Passenger Vehicles

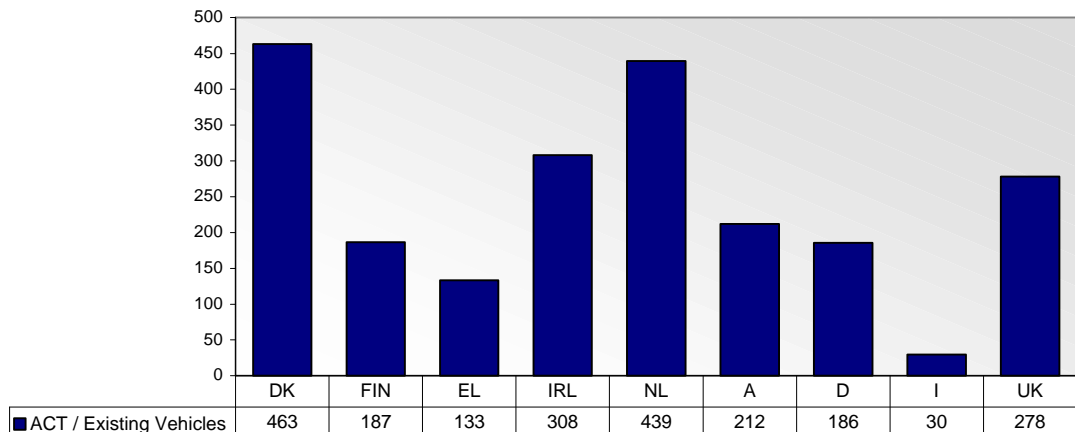
	DK	FIN	EL	IRL	NL	A	D	I	UK
Type of tax	Circulation tax	Circulation tax	Circulation tax	Circulation tax	Circulation tax	Circulation tax	Circulation tax	Circulation tax	Circulation tax
Basis of charge	Fuel consumption of vehicle	Age of the vehicle - progressive	Cubic capacity – progressive	Cubic capacity – progressive rate	Dead weight of vehicle and type of fuel used.	Horsepower	Engine capacity	Fiscal horsepower and district of registration – progressive	Fuel, cc and CO2 emission
Remarks		Only levied on diesel vehicles	Deduction upon old car scrapping proof			Buses exempt	Increased rates for cars not fulfilling EU emission criteria	A part of the tax is decided locally.	See country report

Source: Inventory of Taxes, DETR(UK) and Country Reports

In Finland, circulation tax is rather complex since it is levied on both petrol and diesel cars and not only progressive with the age of the car. For all cars, the tax is FIM 500 if registered before 1994, and FIM 700 if registered thereafter. For diesel cars, a surcharge applies ('diesel tax') that for passengers' cars amount to FIM 150 for every 100kgs on a yearly basis. In Germany the circulation tax has clearly underlying environmental concerns, providing incentives for cars with low emissions, meeting the EU emissions standards. The highest level of circulation taxes can be found in Denmark, Ireland and Netherlands.

In some Member States diesel driven cars face a higher circulation tax than petrol driven cars, often to compensate for the fact that diesel generally faces a lower excise duty than petrol.

Figure 18 – Average Annual Circulation Taxes per Passenger Vehicle (EUR) – 1999



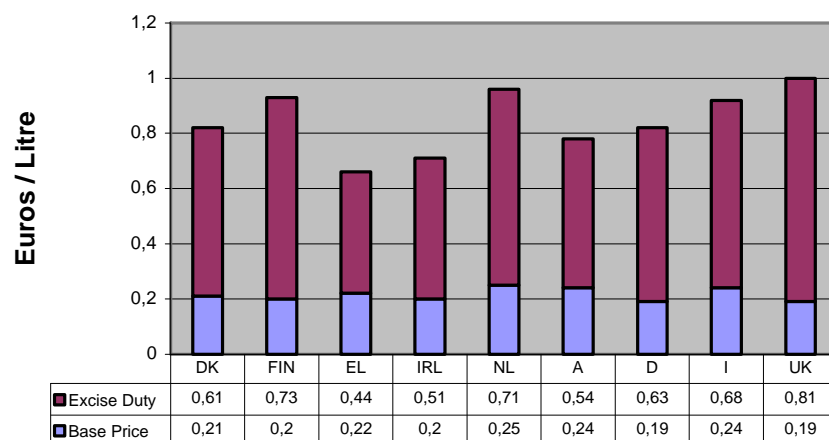
TAXES ON MOTORING

These are taxes directly or indirectly related to the use of vehicles, including fuel taxes and road tolls. Taxes on vehicle usage are mainly the excise duty on fuel and VAT, although some countries also charge through the use of road toll systems. In the scope of our study the latter are not covered.

All Member States levy the standard rate of VAT on fuels. Member States levy higher level of excise duties on leaded petrol than on unleaded petrol, as required under EU law.

The next chart provides an overview on the levels of excise duty on unleaded petrol in all Member States.

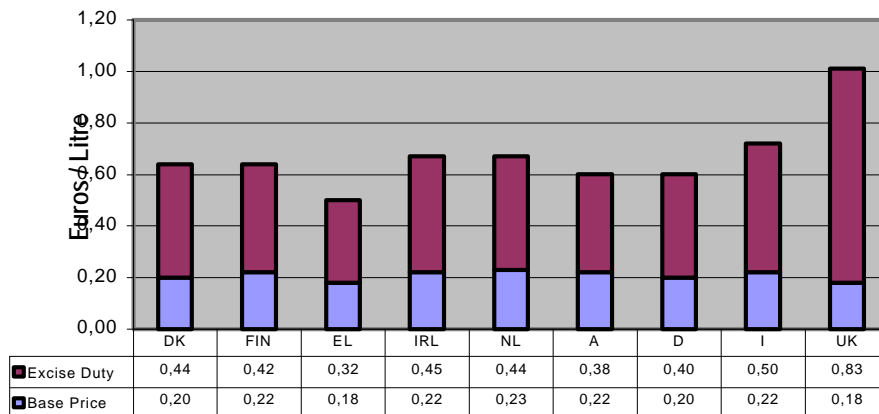
Figure 19 – Unleaded Petrol: excise duty and base price - 1999



Source: DG TREN - Fair and Efficient Pricing In Transport – The Role Of Charges And Taxes

As the chart shows, the highest level of excise duty on unleaded petrol is found in the UK and Finland. The lowest levels are applied in Greece and Ireland. The following chart provides similar information for diesel prices:

Figure 20 – Diesel Prices - 1999



Source: DG TREN - Fair And Efficient Pricing In Transport – The Role Of Charges And Taxes

Consumer prices of oil products and their taxation are fairly uniform throughout Europe. Only the UK practices are significantly above average.

Leaded petrol is subject to higher excise duty than unleaded petrol, reflecting the directives 92/81/EEC and 92/82/EEC.

The minimum fuel duties levels should then be as follows:

- Leaded gasoline: ECU 0,337 per litre.
- Unleaded gasoline: ECU 0,287 per litre.
- Diesel: ECU 0,245 per litre.

In most countries, however, applied duties are even higher.

Lower diesel duties reflect the fact that diesel is mainly used by commercial vehicles. The only exception is the UK, where we can see reflected a significant decrease in the diesel share of passenger vehicles in last years. Fuel taxation plays an important role on tax revenues.

In general, the tax burden assessed by tax fuel on total tax revenue is higher in countries where car ownership is also higher, reflecting higher absolute fuel consumption. Although other countries like Denmark or Finland also apply similar excise duties, acquisition taxes largely outweigh fuel tax revenue there. The relative lower importance of the fuel taxation revenue in this high taxation group of countries is therefore a direct consequence of a lower level of car ownership.

Vehicle Fuel Dependence

The importance of this section should be related to the expectable change in the vehicle's technology with regard to the usage of fossil resources. In fact there is a growing trend towards other solutions based on newer technologies supported by recent important developments on more efficient (lower consumption) and 'cleaner' vehicles, based on energy sources such as hydrogen and electricity. This allows admitting that in a few years the overall tax revenue from vehicle fuel might see a decrease.

However, this trend will probably be accompanied by a gradual increase on fuel taxation burden, grounded on environmental concerns, trying to keep revenues stable. This, in turn, will further stimulate the economic advantages from the investment on newer technologies, meaning that we might be currently facing an irreversible trend.

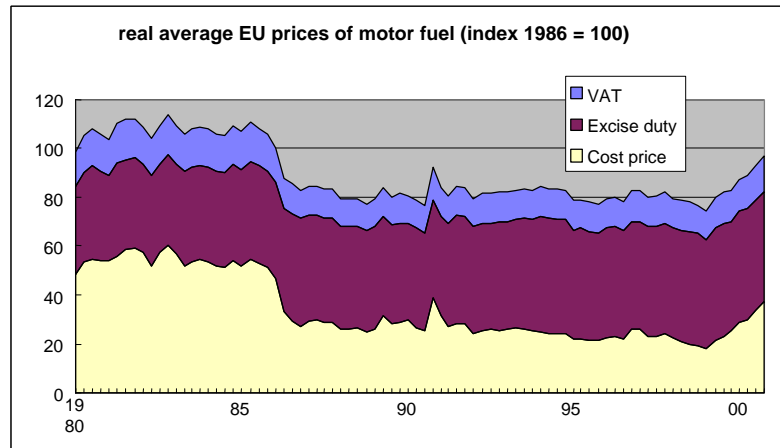
This change has started, since these new technologies are already on their way to the market, whilst the industry is increasingly focusing the attention on 'cleaner' vehicles. Hence, the historical fuel dependence together with growing taxation yield might be at risk, as it might represent the beginning of a transition phase with regard to fiscal policies on vehicles

Current Situation

The vehicle market is still almost fully depending on fuel supply. This dependence level is extremely important because it stresses not only the car usage levels but probably to some extent the decision to buy a car. Fuel taxes directly affect the marginal cost of car journeys, and therefore the level of car use.

The following chart is compounding fuel base prices with the excise duties and the VAT, providing the average fuel retail price for the last 20 years. As we may conclude from the chart, taxes have been historically gaining relative importance in the retail price. In fact, while in 1985 this weight was approximately half of the price, currently fuel taxes account for 2/3 of the retail price.

Figure 21 - Real average price of motor fuels, EU



Source: Oil Bulletin; Eurostat

Although the internalisation of environmental costs is becoming a widely accepted concept and is underlying this trend, taxes levied on this particular item are scarcely earmarked in favour of any environmental purpose (see following section), besides representing some stimulus to decrease specific consumption or the rational use of energy. . A recent study¹¹ regarding taxation preferences reveals that one of the highest levels of citizen's tax acceptance is related to excise duties on fuel, on environmental grounds.

The fuel importance in the overall economy is quite important, as we may expect significant changes in the markets widely depending upon transport, meaning consequences to almost every sector of the economy. Therefore, any approach to the fiscal burden on fuels should have to be carefully considered.

¹¹ Armin Rolfink, 1998.

2.2.3. Tax revenue optimisation

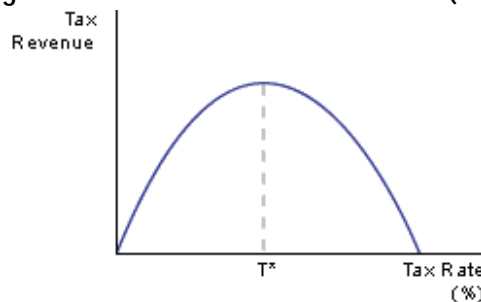
Maximising Potential Revenues

It is important to recognise that raising revenues is not achievable through simple taxation increment, as there are parallel changes in quantity and/or price of vehicles in which taxes apply. Therefore to enable maximisation of total tax revenue, it becomes important to analyse whether fiscal instruments are hindering optimal balance, by misjudging the potential advantages from lightening the taxation burden.

One of the most controversial issues in tax policy analysis is whether a tax cut will boost economic activity to such an extent that the government's budget actually improves. The "Laffer curve" establishes the relationship between tax rates and total tax revenues, or in this case, between taxation burden and tax revenues. The underlying principle is that there exists an optimal level of taxation that maximises total fiscal revenue, which in practical terms also means that there is a maximum effectiveness for the taxation process level. The consequences of such an approach are that, above or below a given level of tax rate (the optimal point, in terms of revenue maximisation), revenues start declining.

In graphical terms, this is represented by the theoretical Laffer curve (next figure):

Figure 22 - Taxation rates and revenues (Laffer Curve)



The knowledge of the elasticities inherent to taxation levels, with regard to vehicle demand is underlying this concept. However the difficulty in assessing reliable elasticities hinders any conclusive quantitative approach. This study includes in the following chapters some assessment of elasticities, in the scope of the impacts arising from taxation on citizens (car ownership) and on the market (car demand).

In both cases, the outcome is rather solid in concluding that variations in taxes have opposite consequences in the level of both car ownership and car demand, which can not outweigh the direct loss on tax yield, which is reflected by an elasticity (negative) less than 1.

Applying the Laffer curve concept implies that vehicle taxation systems are positioned before (to the left of) the optimal tax revenue threshold. In fact, the increase in vehicle taxation is likely to have a positive effect on the total tax revenue.

However vehicle taxation is a compound of different taxes with different natures. Optimisation of vehicle taxation revenue will have to consider that there is an optimal balance between taxes, since it should not be ignored the existence of crossed influences between the various types of taxes.

Registration taxes, annual circulation taxes and fuel taxes represent the most significant shares of revenue accrued from the several taxes applying on vehicles. Hence these 3 taxes are enclosing the key to tax optimisation approach.

The maximisation of tax revenue will have to consider the acceptability associated with each tax, differentiated by its nature. Hence, total revenue is maximised for a mix of taxes.

Optimal Social Taxation

Transport pricing has been a highly debated topic in the countries of the European Union for several years. This debate has been stimulated by the two pricing related policy documents of the European Commission, the Green Paper on Fair and Efficient Pricing and the White Paper on Fair Charging for Infrastructure Use (European Commission, 1995 and 1998) and by national policy and new legislation in several member countries.

The reasons of acceptance or non-acceptance and the conditions favouring acceptability of pricing schemes related to transport have been studied by a consortium led by TIS.PT in a recently concluded study dealing with the whole range of charging and taxation measures in the transport sector (the PATS Research Project). The focus there was on transport prices or charges (against the benefit of a transport service or use of an infrastructure).

Its summarized conclusions hereunder presented are only those considered more relevant for the current study, envisaging to make clear that tax acceptance is definitely a relevant issue that should not be disregarded when addressing changes in the sources of tax revenue, as it may affect the recognition of fairness, differentiation and harmonisation, these being important underlying factors for increased tax acceptance. The avoidance of price shocks is also an important issue here mentioned, with a particular interest in the scope of any envisaged transition period, which should not be disregarded. Meaning that a transitional period should be carefully determined, in face of each country particular situation.

- Several conditions should be met for improving acceptability of pricing changes: the pricing **purpose** has to be clear, sensible and reasonable. The measures have to be perceived to be **effective in solving the stated problems** and there has to be an objective control of that effectiveness. Unless the purpose of transport pricing is well understood, any price increase tends to be seen as a form of money raising and considered as wrong. There is furthermore a strong belief that transport is already too heavily taxed, coupled with little support for ‘user pays’ principle. There is also strong suspicion of government motives in increasing transport related taxes and user charges.
- **Information** seems to be another major issue to enhance acceptability, provided that all other features of pricing measures meet the requirements mentioned before. Pricing measures have therefore to be accompanied by high-quality information about the aims of the measures, their consequences and the winners and losers of the schemes.
- In general, **differentiation** of charges with respect to time, noise and air pollution, quality of service etc. is well understood and accepted. EU-wide **harmonised** taxes seem to be important for recognition of fairness, although both concrete tax level harmonisation and minimum rates at EU-level were seen to be acceptable.
- Information about the **use of revenues** collected through transport charges was seen as critical. There is a strong preference for the revenues raised from transport user charges to be spent on transport and strong opposition to use of these revenues outside transport.
- These **attitudes to transport pricing** and related issues are significantly influenced by a number of factors including, country of residence, regularity of car use, income and to a lesser extent by age, employment and work location.
- The charging scheme has to be **transparent** and its use should be easy and understandable
- Pricing measures should be introduced in a stepwise way, **avoiding price shocks**.

2.2.4. Taxation earmarking

The following table shows the current situation on earmarking of vehicle taxes. Contrary to charges, taxes are not directly related to the use of any infrastructure or service, and are thus more easily left without earmarking. In principle, the resulting freedom also provides for greater efficiency in the use of these State revenues, as their allocation can be subject to a new optimisation exercise in each year.

Table 15 – Taxation Earmarking

		Registration Taxes	Annual Circulation Taxes	Fuel Taxes
DK	LEGISLATIVE COMPETENCE	National Government	National Government	National Government
	ASSIGNMENT	General Budget	General Budget	General Budget
	EARMARKING	None	None	None
FIN	LEGISLATIVE COMPETENCE	National Government	National Government	National Government
	ASSIGNMENT	General Budget	General Budget	General Budget
	EARMARKING	None	None	None
EL	LEGISLATIVE COMPETENCE	National Government	National Government	National Government
	ASSIGNMENT	General Budget	General Budget	General Budget
	EARMARKING	None	None	Partially earmarked to the Ministry of the Environment, Urban Planning and Public Works (15 Euros/1000 litres), to finance pollution abatement measures. 50% of this amount reverts to the environmental fund ETERPS
IRL	LEGISLATIVE COMPETENCE	National Government	National Government	National Government
	ASSIGNMENT	General Budget	General Budget	General Budget
	EARMARKING	None	None	None
NL	LEGISLATIVE COMPETENCE	National Government	National Government	National Government
	ASSIGNMENT	General Budget	General Budget	General Budget
	EARMARKING	None	Very small amount is earmarked for provinces	None
A	LEGISLATIVE COMPETENCE	National Government	National Government	National Government
	ASSIGNMENT	General Budget	General Budget	General Budget
	EARMARKING		Partially earmarked (58%)	Indirect Earmarking (4,88%) for financing of investments in PT
D	LEGISLATIVE COMPETENCE	N/A	Federal (Bund)	Federal (Bund)
	ASSIGNMENT	N/A	Federal states (länder)	Bund and federal states (länder)
	EARMARKING	N/A	None	Additional revenues generated (3.9 bil DM; 2 bil EUR est.) following the increase in the tax rates in April 1999 are earmarked. 6 DPf/l for urban transport infrastructure 1 DPf/l for federal roads 50% of the remaining tax rate for federal roads.
I	LEGISLATIVE COMPETENCE	National Government	National Government	National Government
	ASSIGNMENT	Revenue distributed between: General budget, regions and provinces	General Budget	General Budget
	EARMARKING			
UK	LEGISLATIVE COMPETENCE	N/A	National Government	National Government
	ASSIGNMENT	N/A	General Budget	General Budget
	EARMARKING	N/A	None	None

Source: Country reports, DG Environment – Eco Tax Database 2000

There are however some cases of partial earmarking of fuel taxes' revenues. This has been necessary in some countries, as a result of bargaining at the time of significant increases of those taxes, or as an easily recognisable instrument for stable financing of chronic-deficit public services like urban public transport.

2.3. Vehicle taxation impacts

2.3.1. National Budgets

These impacts will be analysed by assessing the level of budgetary dependence from the most significant taxes applied on vehicles. Two levels of dependence will be shown:

- To relate the vehicle related fiscal income to the GDP.
- To relate the vehicle taxation to the total fiscal income.

The following table provides information about tax revenue amounts (million Euros) for the year 1999 in each country, with regard to the four main fiscal instruments: Registration Taxes (RT), Annual Circulation Taxes (ACT) and Fuel Taxes.

Table 16 – Total Tax Revenue – 1999 (million EUR)

	DK	FIN	EL ¹²	IRL	NL	A	D	I ¹³	UK
RT	2,251	1,023	0,698	0,771	2,828	0,436	0,000	0,627	0,000
ACT	0,866	0,394	0,356	0,414	1,978	0,850	7,881	0,952	7,538
Petrol	1,340	1,850	1,535	0,924	3,149	2,690	22,796	13,010	21,323
Diesel	0,281	0,555	0,992	0,591	2,067	0,000 ¹⁴	10,226	6,581	4,723
TOTAL	4,738	3,822	3,581	2,700	10,022	3,976	40,903	21,170	33,584

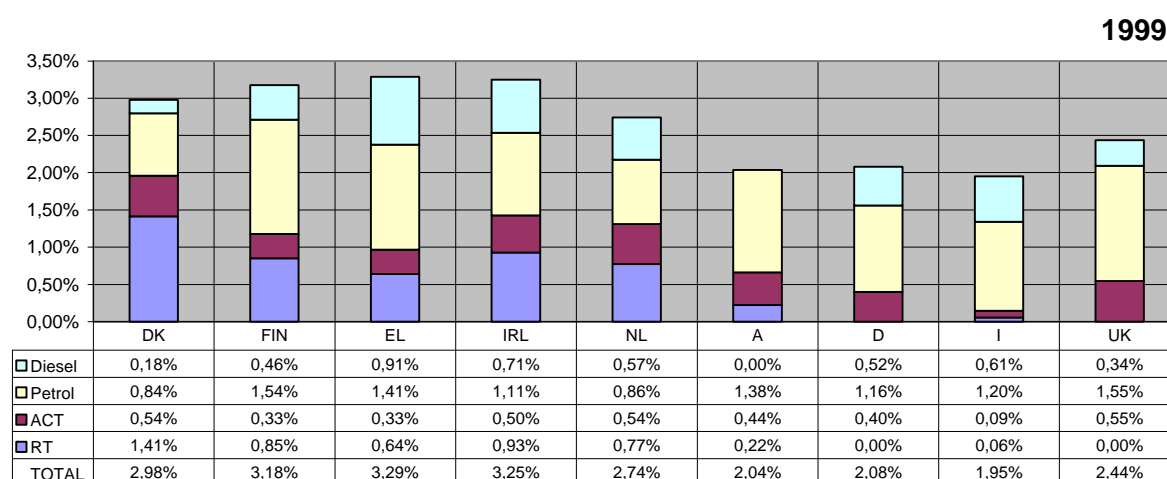
Sources:

OCDE – Revenue Statistics 1965-1999, DG Environment - Eco Tax Database, National Statistics (Finland)

Weight of vehicle related taxes on GDP.

The next chart is showing the relative weight of the vehicle taxation on the country's GDP.

Figure 23 – Taxes as % of GDP – 1999



¹² Estimated from 1997 values

¹³ Estimated from 1997 values

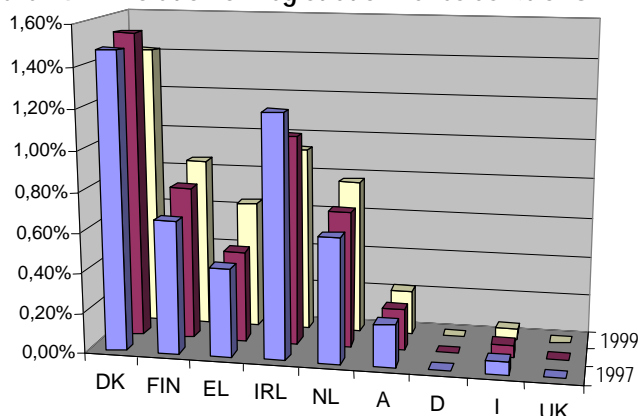
¹⁴ The diesel share is included in the petrol figure, since only total fuel taxes were possible to obtain

It should be remarked that for Austria the petrol taxation level is also including diesel taxation, due to lack of disaggregated data per type of fuel.

It is possible to observe that the main differences across these countries are at the level of the Registration and Annual Circulation Taxes, while other taxes seem to follow a common pattern. Ireland, Denmark and Netherlands registered the highest score for the sum of the registration and circulation tax, with the collected amount corresponding to near 1,5 % of the GDP in 1999 GDP (the registration tax was the major responsible for the result). Italy has the lowest level, 0.13% of the GDP, with fuel taxes being the most important there. The next two lowest values were registered in Germany, UK and Greece.

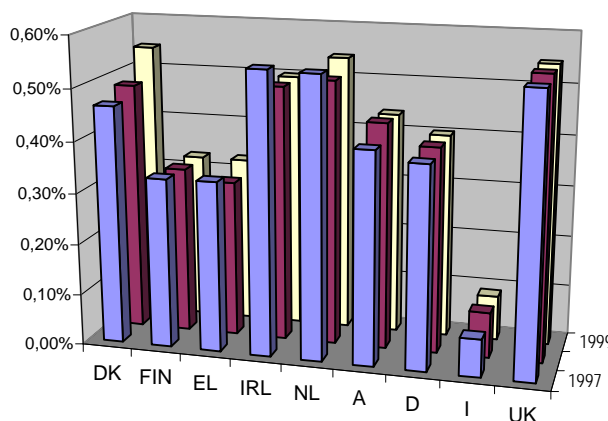
The following two charts provide an overview on the recent evolution in both Registration and Annual Circulation Taxes with regard to the weight on the Gross Domestic Product

Figure 24 – Evolution of Registration Taxes as % of GDP – 1997-99



	DK	FIN	EL	IRL	NL	A	D	I	UK
■ 1997	1,47%	0,66%	0,44%	1,20%	0,62%	0,21%	0,00%	0,06%	0,00%
■ 1998	1,53%	0,77%	0,46%	1,05%	0,68%	0,21%	0,00%	0,06%	0,00%
■ 1999	1,41%	0,85%	0,64%	0,93%	0,77%	0,22%	0,00%	0,06%	0,00%

Figure 25 – Evolution of Annual Circulation Taxes as % of GDP – 1997-99



	DK	FIN	EL	IRL	NL	A	D	I	UK
■ 1997	0,47%	0,33%	0,33%	0,55%	0,54%	0,41%	0,39%	0,07%	0,54%
■ 1998	0,49%	0,33%	0,31%	0,50%	0,51%	0,44%	0,40%	0,09%	0,55%
■ 1999	0,54%	0,33%	0,33%	0,50%	0,54%	0,44%	0,40%	0,09%	0,55%

Weight of vehicle related taxes on total Taxation

The following table shows the weight of total taxation on Gross Domestic Product, from which the weight of vehicle taxation on total tax revenue has been calculated

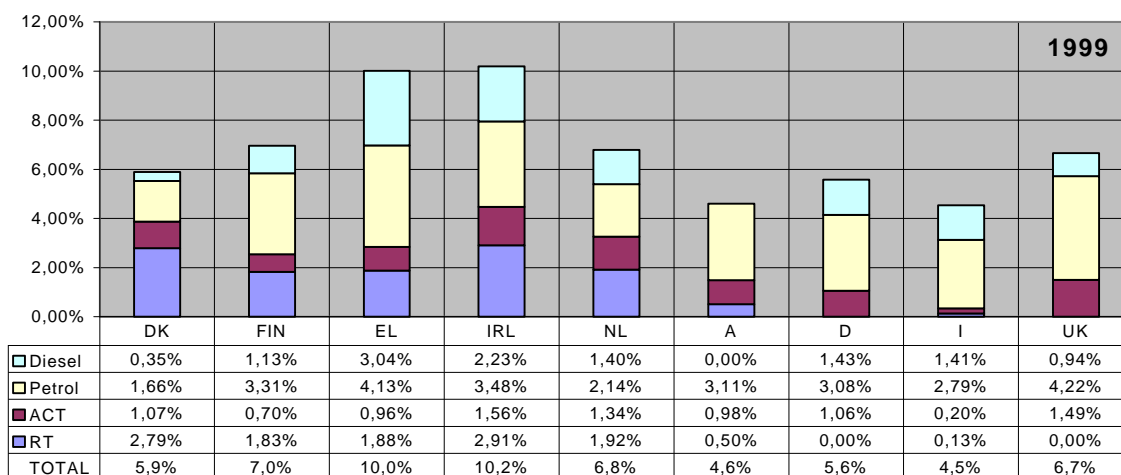
Table 17 – Total Tax Revenue on GDP

	DK	FIN	EL	IRL	NL	A	D	I	UK
1990	47,1%	44,7%	29,4%	34,0%	42,8%	40,2%	32,6%	38,9%	36,0%
1991	46,9%	46,1%	29,5%	33,6%	45,3%	40,6%	36,8%	39,3%	35,3%
1992	47,3%	45,9%	30,5%	34,2%	44,9%	42,2%	37,7%	41,7%	34,8%
1993	48,8%	44,6%	31,0%	34,5%	45,2%	42,6%	37,9%	44,2%	33,3%
1994	49,9%	46,6%	31,3%	35,7%	43,0%	42,5%	38,1%	41,4%	34,0%
1995	49,4%	44,9%	31,7%	33,1%	41,9%	41,6%	38,2%	41,2%	35,2%
1996	49,9%	47,3%	31,8%	33,2%	48,0%	43,4%	37,4%	42,7%	35,1%
1997	50,0%	46,1%	33,7%	32,8%	42,0%	44,2%	37,0%	44,2%	35,3%
1998	49,8%	46,2%	33,6%	32,2%	41,0%	44,4%	37,0%	42,7%	37,2%
1999	50,6%	46,5%	34,1%	31,9%	40,3%	44,3%	37,7%	43,0%	36,6%

Source: OCDE

The figures for Greece in the years 1998 and 1999 were estimated due to lack of available data, using a linear regression analysis.

Figure 26 – Vehicle Related Taxes as % of Total Taxation - 1999



It is remarkable how Greece and Ireland are depending on vehicle taxation to raise revenues. These countries rely heavily on vehicles, which is representing an increased budgetary risk due to the fact that negative fluctuations on the incidence base of the tax due to exogeneous causes, would have an important impact on the national budget. In particular, it should be considered whether this dependence is on an "inventory variable", such as car ownership (circulation taxes) or on a "flow variable", of which some have relatively high inertia like fuel consumption, while others are more volatile, such as new car sales (registration taxes). It should be remarked, once again, that for Austria the petrol taxation level is also including diesel taxation, due to lack of data, disaggregated per type of fuel.

3 IMPACTS OF DIFFERENT TAXATION SYSTEMS

3.1 The functioning of the internal market

The European consumers and vehicle retailers are entitled to expect from the European Union non-distorted market trading conditions reflecting the political principles that underlie the economic union.

However, vehicle trade is subject to practical restrictions, hindering the stakeholders, citizens, retailers and industry, to take full advantage from this Union.

At least four main factors have significant influence on this situation:

- **Different Taxation Levels**
- **Cross Border constraints (Legal constraints, often linked to different taxation levels)**
- **Stakeholders behaviour (Industry and retail)**
- **Exchange Rates**

For consumers willing to engage in cross-border trade, the structural conditions underlying price differentials are irrelevant. What matters to consumers are the pre-tax prices at which they can buy a car, either domestically or abroad. This is so because registration tax is payable in the country of use irrespective of the point of vehicle purchase. In other words, pre-tax prices are the relevant focus for analysing international arbitrage opportunities to consumers. As we shall see, these pre tax prices are decided by the industry taking into account taxation levels. Hence, there are crossed influences between taxation levels and industry behaviour.

Moreover, the fact that some European currencies are still not part of the EURO-zone, has some influence on trade regarding those countries, in particular the UK and Sweden (where the pound and krone fluctuate freely against the Euro, while the Danish krone is effectively pegged on it) from the moment that price levels differ accordingly.

A recent EU-study (Degryse/Verboven 2000) has summarised previous documentation on EU car price differentials and elaborated its own comparative study. The European Commission has collected the used data set on a bi-annual basis since 1993. The study is focussed on prices of new cars.

The Average price dispersion is based on a cross-country econometric partial analysis, looking at the influence of taxes (VAT plus Registration Taxes), exchange rates, dealer margins and right hand drive on car price differentials in MS. The following table is presenting the most important results:

Table 18 – Average price dispersion measures for the European car market

	Period	Average price dispersion*	Change in price dispersion due to adjustment for:				Residual average price dispersion****
			Taxes	Exchange rates	Dealer margin**	Right hand drive***	
Price differential range – including all countries	1995-96	32,9	-6	-0,5	-3,7		
	1997-98	38,9	-6,9	-3,2		-2,6	
	1999-00	38,8	-7,7	-5,7	-0,4	-4,7	20,7
Price differential range – excluding most expensive and cheapest country	1995-96	19,2	-1,7	-0,8	-0,7		
	1997-98	21	-2,7	-1		-0,2	
	1999-00	19,5	-2,8	-1,1	-0,5	-0,7	14
Coefficient of price variation	1995-96	9,2	-1,3	-0,3	-0,9		
	1997-98	10,1	-1,3	-0,7		-0,6	
	1999-00	9,7	-1,5	-1,1	-0,1	-0,8	6,1

* The price dispersion measure of every car model is averaged across all models.

** The differences are computed using the same data set with and without adjustment for dealer margins

*** The differences are computed using the same data set with and without adjustment for right hand drive.

**** Average price dispersion unexplained by taxes, exchange rates, dealer margins and the RHD surcharge. The numbers are based on the joint tax and exchange rate adjustment in Table 31, from which the differences due to dealer margin and RHD surcharge are subtracted. This thus accounts for interaction effects of taxes and exchange rates.

(Source Degryse/Verboven 2000)

A harmonisation of acquisition taxes is reducing the average price dispersion (measured as statistical dispersion from the average) between MS from some 33-39 down to 27-31 or by around 18-20%. The expected change is bigger than the effect of the adjustment of exchange rate fluctuations.

The systematic price differentials in the European car market are shown per country, based on country specific time series. With this approach, changes due to adjustment for taxes and changes due to adjustment for exchange rates can be shown.

Table 19 – Systematic price differentials in the European car market

Period	Actual Fisher index*				Change due to adjustment for taxes**				Change due to adjustment for exchange rates***				Tax and exchange rate adjusted Fisher index***			
	93-94	95-96	97-98	99-00	93-94	95-96	97-98	99-00	93-94	95-96	97-98	99-00	93-94	95-96	97-98	99-00
Austria		105,1	100,1	101,2		1,2	1,2	1		-1,1	0,4	0,2		105,1	101,6	102,4
Belgium	101,9	100,6	97,2	99	-0,2	-0,3	-0,2	-0,2	1	-1,3	0,3	0,1	102,7	99,0	97,3	98,9
Denmark	80,5	80	78,1	79,6	23	23	22,3	24,1	0,7	-0,6	-0,2	-0,4	104,4	102,2	100,1	103,1
Finland		94,5	92	92,2		9,9	9,4	8,9		-2,0	-1,2	-1,0		102,2	100,0	100,1
France	102,7	99,9	98,3	98,7	-0,4	-0,3	-0,3	-0,4	1,1	-0,4	-0,3	-0,4	103,4	99,2	97,8	97,8
Germany	106,3	106,7	103,9	104,9	-0,8	-0,9	-0,9	-0,8	0,8	-1,2	0,3	0,2	106,3	104,6	103,4	104,3
Greece	96,3	98	91,6	90,5	3,2	3	2,9	3,6	-1,9	-0,7	1,6	3,1	97,6	100,3	96,2	97,3
Ireland	97,3	97,7	100,7	96,9	5,1	4,6	4,8	4,8	1,1	1,1	-2	-0,4	103,6	103,5	103,4	101,3
Italy	92,6	92,7	99,8	98,3	-0,3	-0,3	-0,2	-0,1	-1,3	2,3	-0,9	-0,6	91,0	94,8	98,7	97,6
Luxembourg	101,9	100,2	96,9	99,3	-0,8	-0,9	-0,9	-0,8	1	-1,3	0,3	0,2	102,1	98,1	96,3	98,6
Netherlands	100,3	99,6	93,8	94,5	3,8	3,8	3,6	3,7	0,8	-1,6	0,5	0,5	105,0	101,7	97,9	98,7
Portugal	95,2	96,4	95,5	97,1	4,2	5,1	5,1	5	-0,4	-0,6	0,4	0,8	98,9	101,0	101,0	102,8
Spain	93,2	97,2	95,6	93,8	0,8	0,5	0,3	0,3	-1,8	-0,4	1	1,2	92,2	97,4	96,9	95,4
Sweden		98,1	101,1	101		1,4	0,5	0,3		0,2	-1,4	-1,3		99,7	100,2	99,9
UK	100,8	98,9	115,1	116,9	-0,4	-0,5	-0,6	-0,7	3,4	5,5	-4,8	-8	103,8	103,8	109,7	108,2

Source Degryse/Verboven 2000

The biggest change due to the adjustment for taxes would occur in Denmark, because acquisition taxes (registration tax and VAT) level is the highest. This study is a very important basis for our purpose since it is the first systematic analysis of price differentials covering all MS. For our purpose, the tax influence has to be differentiated (VAT, registration tax, annual vehicle tax) and other output variables (besides price differentials) have to be analysed.

Taxation Levels

In the Background Paper (EU 1997), a price comparison shows that for 43 of the total 75 models examined, tax-exclusive prices differ within the Community by more than 20%. It should be noted that the three highest tax Member States, Denmark, Finland and Greece were not included in the study. A frequent price comparison is also carried out by the EC-DG Competition every six months, regarding price differentials, which has repeatedly shown the existence of significant price differentials. Although some of the differences might be explained by factors such as market structure and consumer preferences, the potential impact of the different tax regimes on tax exclusive prices can not be ignored. The assessment of the market distortions induced by the different taxation regimes applied in the different countries is here developed upon comparative analysis of the following indicators¹⁵.

The next table provides segment details compounding the retail price index. The global average retail index is also calculated for each of the 9 countries.

¹⁵ The indicators are published by Eurocarprice.com in association with Jato Dynamics Ltd and Credit Suisse First Boston.

Table 20 – Retail Price Index – June 2000

Countries		DK	FIN	EL	IRL	NL	A	D	I	UK
Segment Price Index	Mini	175	---	90	129	107	110	104	93	120
	Small	164	132	90	126	109	108	106	91	129
	Lower medium	170	129	98	123	109	111	100	93	131
	Upper Medium	170	130	112	124	109	110	97	99	121
	Executive	202	140	131	131	117	111	92	101	114
	Luxury	257	182	148	138	126	109	90	98	110
	Fullsize MPV	186	150	---	137	114	113	97	94	118
	Large SUV	216	167	---	149	128	113	94	99	126
	Small MPV SUV	177	137	109	127	109	114	101	96	125
	Sport Coupe	220	167	152	140	119	110	92	97	121
	Cabrio and Roadster	229	---	133	146	126	107	90	100	122
Country average		180	143	104	128	112	110	99	96	124

Data source: Jato Dynamics Ltd – June 2000¹⁶

- **Retail price index:** represents the consumer's view, showing the retail prices inclusive of the tax burden (includes VAT) in each country and is weighted by sales volume. Despite the VAT inclusion in the retail price analysed by "Eurocarprice", its effect is not changing significantly the core of the analysis undertaken, that is to evaluate the differences caused mainly at the level of the Registration Tax, since VAT is a comparatively homogeneous tax amongst the analysed European countries.
- **Base price index:** represents the price of the vehicle, adjusted for specification differences between markets and excluding all taxes. It represents an important tool for understanding the potential cross border exchanges, as tax is payable in the country of use irrespective of the point of vehicle purchase.
- **Average percentage of the retail price (excluding delivery charges) that is represented by tax:** compares the average car taxation burden imposed in each country. This is the result of a comprehensive weighed average developed by Jato Dynamics Ltd, considering each model and quantities sold, being possible to identify clearly the average percentage of tax applied to passenger vehicles. As we can see, the countries where the so called Registration Tax is zero, have still represented a tax that is the VAT. In those cases, as we could expect, it reflects the flat average of tax imposed on acquisition.

The next chart is providing comparable indicators for base price index, average taxation burden and retail price index, allowing to confirm the fact that the base prices are adapted to the market depending on the taxation levels imposed.

Table 21 – New Vehicles Price Index and Taxation Burden – June 2000

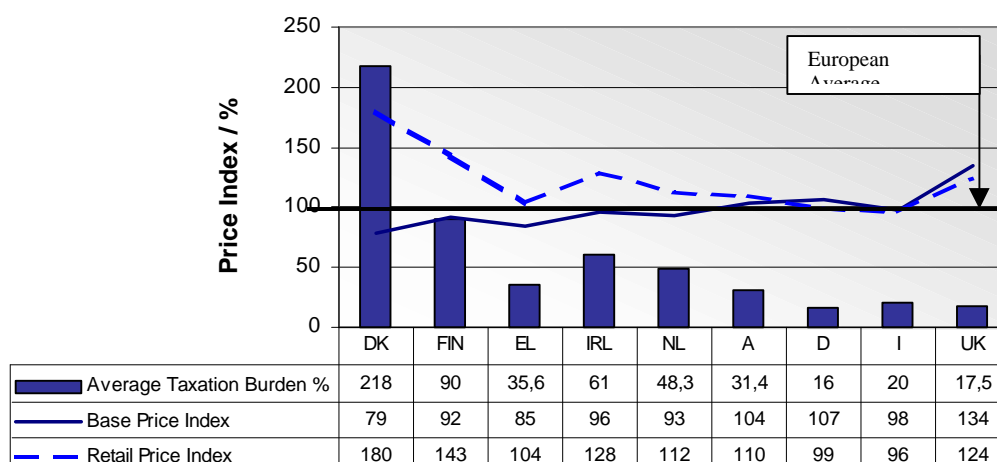
Country	DK	FIN	EL	IRL	NL	A	D	I	UK
Base Price Index	79,0	92,0	85,0	96,0	93,0	104,0	107,0	98,0	134,0
Average Taxation Burden %	218,0	90,0	35,6	61,0	48,3	31,4	16,0	20,0	17,5
Retail Price Index	180,0	143,0	104,0	128,0	112,0	110,0	99,0	96,0	124,0

Data source: Jato Dynamics, Ltd.

The next chart allows a clear visualisation of lower base prices' trend in the high taxation countries. The differences in the retail price among the European countries are partially softened by the management of base prices by the industry. Naturally, the gap between base price index and the retail price index increases from the low taxation countries to the high taxation countries.

¹⁶ Retail Price - Manufacturer list price for vehicle inclusive off all taxes, adjusted to specifications (100 models)

Figure 27 – New Vehicles Price Index and Taxation Burden – June 2000



In this chart the UK appears as the country with the highest base price index, with the retail price index clearly distant from the other two countries included in the low taxation group.

The index shows that the base price in the UK is 34% above the European countries average, with Denmark showing the lowest value (- 21% in relation to the same average). It should also be remarked that the retail price index in the UK is similar to Ireland, the geographically closest market, but with a very distinct distribution of that final price between base price and tax.

Arbitrage opportunities may however exist, when UK consumers directly import vehicles, taking advantage of pre-tax prices, for instance, in the Netherlands, which are in average 30% lower than in the UK and then pay the 17,5 % VAT. This happens because all the taxes are due in the country of vehicle use, irrespective of the point of sale.¹⁷

A recent study developed by the Centre for Economic Policy Research, for the EC¹⁸, measured the prices that could be obtained if taxes had been harmonised across countries (using a methodological approach based on a set of assumptions about the degree of tax and exchange rate passed through) concluding that a tax adjustment would lead to lower price dispersion. In the same study, the forecasted price differential range between the most expensive and the cheapest country went down by around 6-8 percent. One of the practical implications of these findings was that after a tax approximation, Denmark would no longer be one of the cheapest countries (on base price terms), and would become in fact one of the most expensive ones.

Cross Border Constraints

Cross border constraints such as double taxation if moving from one country to another or specific administrative expenses if direct importing cars are clearly distorting free market conditions. It has to be considered however, that some of these constraints are linked to outweigh adverse effects of different market prices. Based on the analysis shown above, it becomes obvious, that international car dealers outweigh different taxation levels by different base price policies. In order to prevent inhabitants from buying cars in order to profit from lower base prices, specific cross border regulations can be explained.

Stakeholders

- Industry

Although this aspect is not intended to be subject of any in-depth analysis in the scope of this study it should be, however, mentioned that from the producer viewpoint the differences in vehicle taxation systems have a negative impact in their ability to take full advantage of the single market. The price differentials across Europe and the need to adapt the model for specifications, tackling taxation rules represent a cost for the industry.

¹⁷ Eurocarprice 2000

¹⁸ Centre for Economic Policy and Research, 2000, Car Price Differential in the European Union: An Economic Analysis – An investigation for the Competition Directorate-General of the European Commission.

Economy of Scale: Different taxation regimes mean that manufacturers have to produce different specifications of the same model in order to adjust to the different markets. Taste variations would still impose a range of specifications but probably to a smaller extent.

Tax Transferring: The producer defines the base price strategy according to the final price that the consumer is willing to pay for the vehicle taking into account the economic, monetary and fiscal general situation of the country. It also accounts for purchasing power, the price of other models competing in the same segment, market share objectives and the relative importance of customers' clusters.

The generally low pre-tax prices in Finland, Denmark, and Greece are largely due to manufacturers' pricing policies. Because of high taxes on car purchase in these countries, most manufacturers fix pre-tax list prices at a low level. On the other hand, where no such taxes are charged like in the producers' countries, prices before tax are much higher. The following quotation reflects exactly this reality.

"Owing to high car purchase taxes in Denmark, Finland, the Netherlands and Portugal, most manufacturers determine list prices before tax for those countries at a low level, arguing that this is necessary for selling their cars at affordable after-tax prices. In the United Kingdom, where no such extra tax is charged, the price level is generally very high. However, this price includes the additional cost of UK specification, in particular right-hand drive, and the high value of the British Pound. Consequently, these aspects have to be considered as one of the causes for high price differentials"¹⁹

Industry seems to be seizing the fiscal opportunity offered in countries not applying acquisition taxes, raising the base prices there to compensate for the losses / less profits in other markets. That fact is supported by evidence that the retail margins are much wider in these countries, as previously seen.

The legal framework behind this behaviour is known as the Block Exemption and is reflected in the EC Regulation 1475.95²⁰, which replaced Regulation 123.85 at the expiry of its 10-year term. It runs until 31st September 2002, exempting vehicle manufacturers from the provisions of the Treaty of Rome prohibiting vertical restraints to trade.

The Selective and Exclusive Distribution (SED) systems used by vehicle manufacturers in Europe would be illegal without this exemption, since complete control over distribution networks is usually considered as anti-competitive.

The automotive industry argues that motor vehicles are complex objects that require professional maintenance and repair on safety grounds. Therefore there is an underlying natural link between the sales of new vehicles and the aftermarket. Only selected franchised dealers are allowed to sell new cars to retail customers. The dealership contracts generally enforce exclusive representation of only one brand. Moreover, they must also sell all products in the brand range – they cannot choose. In return, they are granted exclusive territories, protected from direct prospecting by other dealers.

This system and the Block Exemption have become an increasingly serious problem. The European Commission has received several complaints from consumers who were prevented in their attempts to purchase vehicles in other European countries. This legal framework is now under discussion and the outcome is still not clear.

Changes on the current situation would have an important impact in the degree of control that the vehicle manufacturers have had so far over their routes to market.

"Comparisons between the US and (to a lesser extent) UK or Dutch economies and most other continental European ones suggests that freedom from arbitrary restraints promotes productivity gains and thus economic well-being, even if some painful readjustments are needed"²¹

Block exemption might not have achieved part of the aims stated by the Commission in 1995 when it renewed its permission to use selective distribution networks for the sale of motor cars. For the consumers in particular this system doesn't seem to be a fair one, thus losing the opportunity to take full advantage of the European single market. However, it is definitely helping to flatten retail price differentials, in particular those in the high taxation countries.

¹⁹ Car prices in the EU: price differentials remain high - DN: IP/00/781 Date: 2000-07-13

²⁰ Source: Autopolis

²¹ Source: Autopolis

- **Retailers**

Sales are linked to retail networks fully controlled by the industry based upon legislation that allows Selective and Exclusive Distribution (SED) systems. The impacts of the taxes are mainly related to the different margins of the retail according to the level of taxation.

The recommended prices, excluding taxes, are relatively low in the countries where vehicle taxation is high. The VAT rates, similarly to the other taxes, also differ from country to country²². It should be noticed, however, that for company cars VAT is, at least in some Member States, deductible. The EC Regulation 1475/95²³, does not contain any provision about the retailer's margins, but imposes to the manufacturers, when calculating the margins, to distinguish between car supply and spare parts supply. Most of the margins of the concessionaires consist in a discount over the recommended retail prices. This discount is the same, for big and small concessionaires, located in a given Member State and belonging to the manufacturers net. The discounts granted by the manufacturers to the concessionaires, goes from 5% to 20% of the recommended retail price of the car, and are influenced by the model and by the country market. On the other hand, the fleet operators and other special clients can benefit from a discount that could go up to 40% (generally between 20% and 40%). The next chart shows the average gross dealer margins in 1996, reflecting a slight trend towards higher dealer margins in the Low Taxation countries, with the exception of Finland, included in the group of the High Taxation countries.

Table 22 – Average Dealer Gross Margins

	DK	FIN	EL	IRL	NL	A	D	I	UK
Average Gross Dealer Margins	6,4%	15,1%	8,3%	16,4%	17,2%	17,8%	18,9%	16,6%	13,5%

Source: EC - Car price differentials in the European Union: An economic Analysis

In the last few years, a parallel market for new vehicles has developed within the European Union. This was made possible because manufacturers brought their vehicles onto the different markets within the European Union, differently equipped but most important, at different prices. Due to price differences, this parallel trade is made possible and even attractive for consumers and independent vehicle traders alike. (Source: *European Association of Independent Vehicle Traders EAIVT*²⁴)

Exchange Rates

Another issue that deserves to be addressed is the linkage between the evolution in the exchange rates and car prices. Before the introduction of the Euro, the currencies more affected by exchange rate variations were the Italian lire, the Swedish krone and the British pound.

After 1 November 1999, the variations on the exchange rates were limited to the sterling pound and the Swedish krone. In order to avoid competitive losses or to preserve the possible advantages arising from the variation in the exchange rates, the manufacturers are not very keen on adapting the local prices to the changes occurred in the exchange rates.

The prices, evaluated in Euros, increase whenever currencies out of the Eurozone are appreciated, meaning that more Euros are necessary to buy a car in those countries. Hence vehicles become more expensive to be bought by foreigners and statistics appear with increased values for vehicles in those countries. But of course, the reverse picture would occur in the case of revaluation of the Euro with respect to these currencies.

Market Transparency

Different tax structure and administrative problems might lead to lack of transparency and thus to increased transaction costs for the consumers.

Applicable taxes are due where the vehicle is used (or where a citizen shows enough evidence of living in) as opposed to where it is purchased, contrary to what happens to other goods available within the European market. And this is enough to be

²² Source: EC 2000 - Report on the evaluation of the EC Regulation n. ° 1475/95).

²³ On the application of the n. ° 3 of the article 85 of the EC Treaty on certain categories of distribution, sales and after sales services of vehicles.

²⁴ <http://www.eaivt.com/public/pigb.htm>

considered as a distorting factor, by promoting unfairness, since people in some smaller countries of high taxation can seize the geographic factor to develop active tax avoidance (through using cars registered in a neighbour country with low taxation), while others do not have that possibility.

A move to bring vehicle taxation (mainly on acquisition) in line with all other goods could change the picture. Imposing tax at the point of sale would mean that local governments would have to review their policies.

Low taxation countries could see this as a short-term opportunity to increase tax revenue through increased sales (and exports to other countries), but in reality, manufacturers would probably move to harmonise list prices to restrict cross border movements.²⁵

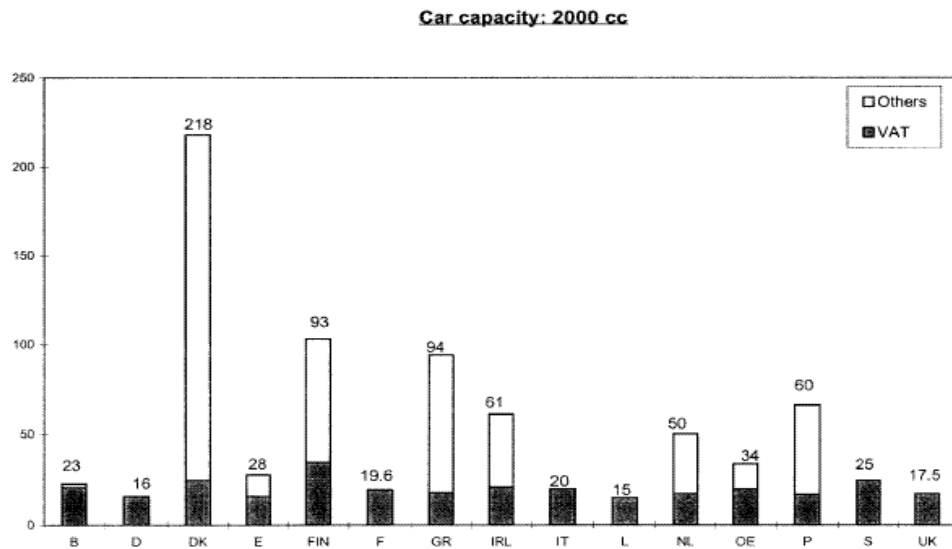
These arbitrage opportunities are, however, unclear to the vast majority of the market, and thus not widely used. They are not creating clear market opportunities, due to the complexity of the system surrounding the vehicle market. Opting to let retailers deal with the bureaucracy imposed by the fiscal system on vehicles becomes the natural thing to do, from the consumer perspective. This leaves the European vehicle market mainly under the control of manufacturers and their exclusive retailers.

3.1.1 European citizens

From the citizen's viewpoint, vehicle taxation systems in the European Union might have significant impact to the extent that the different systems associated to wide variations on the retail price of a vehicle may hinder equity. Beyond considerations about the different levels of welfare, taxation is probably representing a hindrance to increased levels of car ownership, which might be considered also as an important impact. The mobility level associated to households, as a consequence of car ownership, also becomes an important issue to assess the extent of the impact.

The following chart provides a recent example on the wide differences among European countries regarding tax burden for a given engine specification, representing a clear example of how taxation is distorting retail prices of the vehicles compared to other goods.

Figure 28 - Tax as a percentage of the net price of the car - April 2001



Source: ACEA

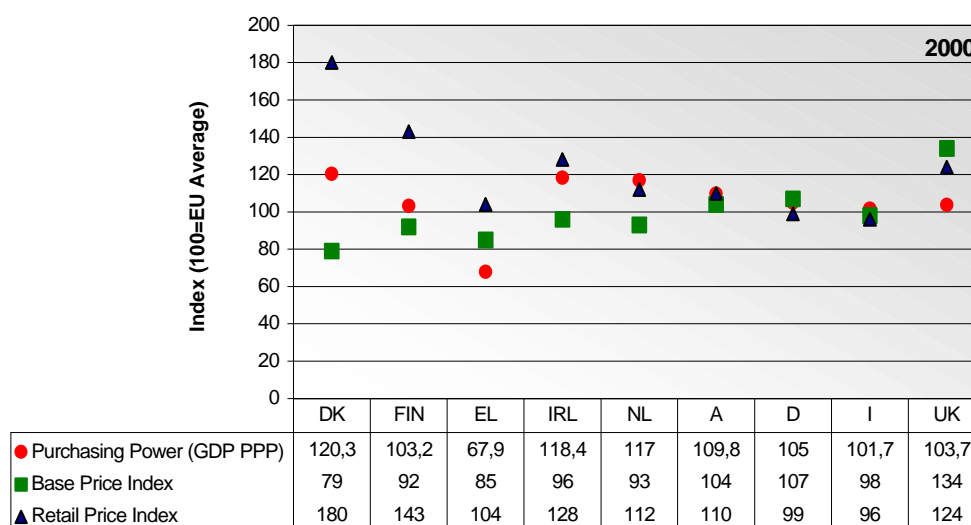
²⁵ Source: Eurocarprice.com Journal

Equity Concerns

The price of the vehicle, or retail price, represents one of the first consequences of taxation and is the determinant factor in the decision of whether to buy a vehicle. In the previous section 3.1, it was seen how base and retail prices are differing among the European countries. This allowed concluding that the variations on the base price are managed by the industry in accordance to the level of taxation, thus smoothing the differences in the final retail prices across Europe.

Here, we combined this information with the purchasing power indicator, trying to assess how taxation is distorting equity levels amongst the European countries. In fact, the next chart clearly shows that the European average indexes for both Retail Price²⁶ and Purchasing Power²⁷ for the year 2000 were distorted according to the taxation group considered, in particular the high taxation group of countries, which are most penalised by the taxation burden imposed.

Figure 29 – Price Indexes and Purchasing Power - 2000



Sources: JATO Dynamics Ltd & Credit Suisse First Boston, EUROSTAT

Denmark, Finland and Greece present the most significant differences. On the other hand, most of the other countries present retail prices in line with the purchasing power index.

Two countries – Greece and UK - are seen here in a particular position, being the only ones where the Base Price Index is above the Purchasing Power index. Albeit belonging to opposite groups of taxation, in Greece this relates to the very low purchasing power, while in the UK the reason for this difference is in the base price, which is by far the highest in Europe.

However it should be made very clear that the evolution of the exchange rates with regard to the British pound has influence on this result. The probable overvaluation of the UK currency might be misleading real price differentials, since both retail and the base price analysis are using Euro currency, which could be inflating such impacts.

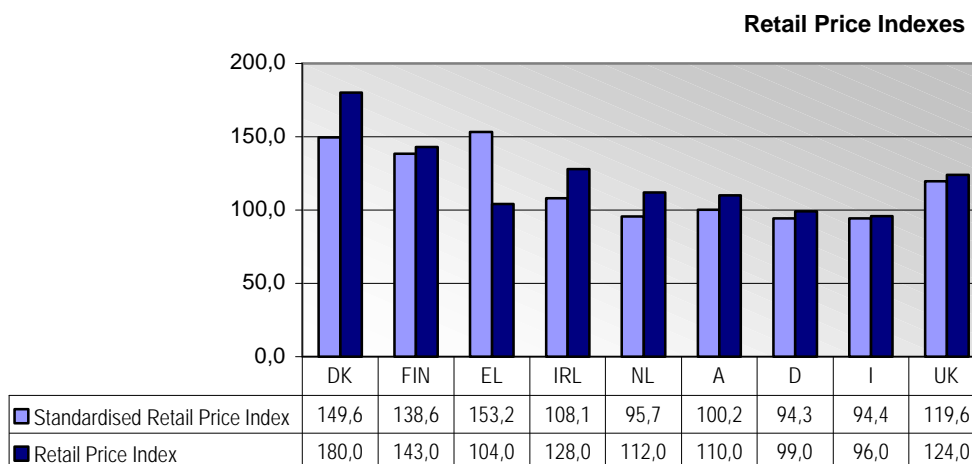
Further standardisation (RPI / PPP²⁸) of the retail price index allows some convergence, according to the next chart. The most important observation regards Greece, where the standardised retail price index increased to become the highest amongst the European countries analysed.

²⁶ Source: Eurocarprice, Credit Suisse, First Boston

²⁷ Source: Eurostat

²⁸ Retail Price Index / Purchasing Power

Figure 30 – Retail Price Index – Standardised Retail Price Index (RPI / PP) - 2000



The next table summarises the relation between standardised price levels and the European Union Average (100). Except for the UK, the differences observed are mainly associated with high taxation levels. The standardised price level in Greece reflects in particular the significant lower purchasing power. Considering deviations above 25% as reflecting high impacts, and below 10% representing low impacts, a qualitative assessment of the real impact arising from the different taxation levels is made.

Table 23 – Taxation Impacts on New Vehicles Price Index

	DK	FIN	EL	IRL	NL	A	D	I	UK
Standardised price level above European Average	50%	39%	53%	8%	-4%	0%	-6%	-6%	20%
Qualitative Impact Assessment	High	High	High	Low	Low	0	Low	Low	Average (*)

(*) – British pound exchange rate should be considered as a powering factor to such difference.

Hence, the main conclusions are:

- Vehicle taxation is influencing retail prices to an extent that outweighs purchasing power factor. For Greece this situation is dramatic, as these two factors add up
- Base prices are managed by the industry to partially compensate high taxes reflected in the retail price.
- Should base prices be forced to be the same, then this situation would be worsened, since the industry is partially absorbing the taxation burden.
- Base prices in the UK, where no registration taxes are applied, are significantly higher than the European average, partially caused by the increased exchange rates, which have a direct influence on retail prices.

Car Ownership

The influence of taxes on car ownership was already qualitatively assessed in previous sections of this report. According to that preliminary approach, there seems to be some evidence that car ownership is to some extent depending on taxation levels, since this is an important factor to compound retail prices.

Moreover, a study of Shipper²⁹ analysing the impact of taxation on car ownership and use shows that in countries where ownership tax is important, the value and characteristics of the cars are affected. Other important findings of the study were that purchase taxes are likely to restrain ownership and that there is a strong relationship between acquisition and ownership taxes and the importance of car industry in a specific country.

In order to provide more specific analysis, these influencing factors have to be differentiated further. In this section we provide first results of a cross sectional model (including the 9 countries and data for 1999). Some of these results are mainly indicative as in chapter 4 more detailed models are constructed and presented for some variables, based on a large data set on sales of individual brands and models.

We can suspect that a few variables may reasonably explain the behaviour of the market in terms of car ownership, or at least provide grounded qualitative assessments, which are still lacking so far. The fact that fuel taxes are primarily entailed to the vehicle usage and not the ownership led us to discard that variable in this particular model.

Explanation of car ownership levels seems to come out of these four main variables:

- a) - *Purchasing Power*
- b) - *Significant Existence of Car Industry in the Country*
- c) - *Registration Taxes*
- d) - *Annual circulation Taxes.*

The resulting model expression will be shaped from these assumptions and is represented by

$$CO = f(RT, ACT, PP, IND)$$

In this model, registration tax burden (RT) will be assessed taking the average taxation burden as comprehensively calculated by Eurocarprice, (see Table 21 – New Vehicles Price Index and Taxation Burden – June 2000) including VAT as part of the tax. This way it is assured that VAT, which in fact influences retail prices, is included in the analysis, being reasonable for this purpose to consider that they are part of the registration taxes for this effect. Annual circulation taxes burden (ACT) is assessed from the average taxation burden per each vehicle of the fleet. The existence of the “industry factor” was inserted as a dummy variable (Yes=1/No=0). The data set for the model was obtained using for each variable the average between 1997 and 1999, as a data smoothing procedure, exception made for the previously referred registration burden, taken as of June 2000. The resulting value was then subject to a cross sectional analysis.

Table 24 – Data set for model (average from 1997-99)– Tax Impact on Car Ownership³⁰

	CO	RT (Index)	ACT (€/car)	PP	Ind
DK	346	218	422	120	0
FIN	392	90	186	101	0
EL	243	36	131	67	0
IRL	334	61	314	107	0
NL	395	48	393	115	0
A	482	31	209	110	0
D	510	16	183	107	1
I	548	20	28	103	1
UK	446	18	276	103	1

The statistical quality output (after discarded the industry factor due to strong correlation factor with other independent variables) considering the other 3 independent variables mentioned, is nearly 88%.(R²), reflecting a quite relevant statistical fitness for the resulting model.

²⁹ Shipper Lee 1995.

³⁰ The variable CO (Car Ownership) is defined as the number of registered vehicles per 1000 inhabitants

Table 25 - Summary of Car Ownership model results

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	,938 ^a	,881	,809	41,0440	,881	12,296	3	5	,010

a. Predictors: (Constant), VAR00004, VAR00002, VAR00003

The expression relating car ownership with these variables resulted as follows:

$$CO = -88.4425 - 0.471*RT - 0.527*ACT + 6.443*PPindex$$

By applying logarithms to the variables in the model, it was possible to further assess approximate elasticities for both types of taxation and also purchasing power, with regard to car ownership.

Table 26 - Elasticities in Car Ownership Model

	RT	ACT	PPindex
Car ownership	-0.144	-0.121	+ 1.244

The statistical significance of such assessment is hereunder summarised in the correspondent SPSS output table:

Table 27 - Model results for Car Ownership Model

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B	
	B	Std. Error				Lower Bound	Upper Bound
(Constant)	1,43566	0,85839		1,67249	0,15529	-0,77088	3,64219
LN RT	-0,14369	0,04265	-0,50677	-3,36935	0,01990	-0,25332	-0,03407
LN ACT	-0,12133	0,04620	-0,41400	-2,62627	0,04674	-0,24009	-0,00257
LN PP	1,24438	0,19830	0,87853	6,27541	0,00151	0,73466	1,75411
Dependent Variable: LN CO							

The exercise hereby developed is meant to provide support to the conclusion that variations on vehicle taxation, according to its nature, either on registration/acquisition or ownership is likely to have impacts on car ownership to the extent of the respective elasticity. The absolute value of the elasticities represents the measure (proportion) of the impact in the output variable (CO- Car Ownership) by changing one unit in the associated input variable. The signal that is associated to each of those values for the elasticity provides the notion of being either a direct or inverse proportion resulting from changing one unit in the associated input variable. In general terms, positive elasticities mean that an increase in the associated input will also result in a certain increase on the output (measured by the absolute value of the elasticity). A negative signal means the opposite, that is, any increase on the input variable will mean a decrease of the output variable.

Therefore, the interpretation of these results is that any increase on both RT or ACT will mean a decrease on car ownership (the expression of such impact given by the coefficient), while any increase on the Purchasing Power will tend to increase car ownership. It should be noticed that the expression of each of these 3 impact seems to be clearly pointing at a prevailing importance of the purchasing power, over the taxation levels. The interpretation of these results, using more practical terms, is that there is an indication that car ownership may be significantly increased by improvements in purchasing power, while an increase in RT or ACT, although affecting negatively car ownership, will only do so in a rather smaller proportion.

The next table summarises and compares a review³¹ of several studies of elasticities relating annual circulation taxes and acquisition taxes with car ownership.

³¹ Complete table included in ANNEX

Table 28 - Comparison of elasticity parameters in car ownership models

	ANNUAL CHARGES (VEH.TAXES)		PURCHASE TAXES/CAR PRICE	
	Short term	Long term	Short term	Long term
OUR MODEL	-0.121		-0.144	
REVIEW OF ELASTICITIES³²		-0.081 -0.08/-0.04 (-0.06)	-0.38	-0.89 (-0.4/-1.6) -0.253 -0.77/-0.6 -0.28/-0.57

The differences between the estimated elasticities and the reference elasticities from the review of elasticities might be reflecting a change in the balance between the influences of both ACT and RT on car ownership in the recent years, which might be related to the growing weight of annual circulation taxes in some countries.

At this stage and according to this analysis it is possible to support that:

- Both RT and ACT have non-negligible impacts on car ownership, considered the data set.
- That these impacts are significantly smoothed by purchasing power, which clearly explains the quite different performances of different countries, within similar fiscal frameworks, such as Denmark and Greece.

Cross Border Mobility

Apart from problems related to distortions in competition there are other areas of concern from the point of view of the final consumer. Individuals moving between Member States – temporarily or permanently – often encounter problems of double taxation (having to pay tax twice, or difficulties in satisfying the authorities that a second payment is not due) because of the different tax regimes..

3.1.2 Vehicle fleets

Average Age

In view of the environmental and safety negative impacts of ageing fleets, it is worth trying to explain the extent of the influence of taxation levels on this indicator. In order to assess the influence of taxation level on the average age of the fleet, it was developed a cross sectional model based upon data gathered for the year 1999 and 2000.

The cross sectional data set that would describe the behaviour of the average age of the fleet is defined hereunder, using purchasing power and short term interest rate (reflecting consumer credit cost) as additional independent variables, besides vehicle-related taxation burden, trying to explain the average age of vehicles.

³² See Annex: Review on Elasticities

Table 29 – Model Data Set

Country	Dependent Variable	Independent Variables		
	Average Age	Taxation burden ³³ (2000)	Purchasing Power ³⁴ Moving average (95-99)	Interest rate ³⁵ Moving average (95-99)
DK	8,2	218,0	119	0,042
FIN	9,6	90,0	99	0,041
EL	9,5	35,6	67	0,135
IRL	5,5	61,0	102	0,058
NL	7,0	48,3	112	0,035
A	7,0	31,4	111	0,037
D	6,7	16,0	108	0,037
I	8,2	20,0	103	0,077
UK	6,1	17,5	100	0,065
	Inventory Variable	Flow Variable (Average Inertia)	Flow Variable (High Inertia)	Flow variable (Low inertia)
Nature of the Variable				

Average Age: the weighted average age for passenger vehicles as of 1997 (source: EUROSTAT)

Taxation Burden: Average percentage of the retail price (excluding delivery charges) that is represented by acquisition taxes (VAT plus RT). Compares the average car taxation burden imposed in each country. This is the result of a comprehensive weighed average developed by Jato Dynamics Ltd, considering each model and quantities sold, being possible to identify clearly the average percentage of tax applied to passenger vehicles. This indicator is in itself reflecting a weighted average of the taxation in each country, thus allowing a better adherence to the real situation, and therefore a better fitness for the simple modelling approach, hereby developed (Source: Jato Dynamics Ltd.)

Purchasing Power: index based on the standardised GDP per capita, (Source: OCDE)

Interest rate: short run interest rate reflecting credit interest rates to consumption/vehicle acquisition (source: EUROSTAT)

Because we are relating an "inventory" variable reflecting cumulative situations (Average Age), with flow variables, reflecting current conditions, it was thought more correct to represent the latter by the moving average of the latest 5 years, for which data was available. An exception is the Taxation Burden, that for the analysis considered may be considered in practical terms as an inventory variable, given the relative stability of the fiscal frameworks with regards to vehicle acquisition in Europe in the last few years. By using specialised statistical software³⁶ we were able to obtain complete statistical outputs, which we will hereunder summarise:

Table 30 - Summary of Average Vehicle Age model results

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				Durbin-Watson	
					R Square Change	F Change	df1	df2		Sig. F Change
1	,804 ^a	,646	,433	1,0806	,646	3,038	3	5	,131	2,858

a. Predictors: (Constant), IRATE, TAXBURD, PP

b. Dependent Variable: AGE

The fitness of the model ($R^2=0,646$) reflects the partial explanation of the average age of vehicles from the dependent variables, which however can be considered as a reasonable value, considered the different natures of the variables.

³³ Source: Jato Dynamics Ltd and Credit Suisse First Boston

³⁴ OCDE

³⁵ EUROSTAT

³⁶ SPSS

Table 31 – Coefficients in the Average Vehicle Age model

Coefficients^a

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B		Correlations			Collinearity Statistics		
	B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF	
	1	(Constant)	21,968			7,714			2,139	41,797			
	TAXBURD	1,398E-02	,007	,623	2,134	,086	-,003	,031	,285	,690	,568	,831	1,204
	PP	-,130	,061	-1,373	-2,132	,086	-,287	,027	-,538	-,690	-,567	,171	5,850
	IRATE	-2,99E-02	,028	-,672	-1,086	,327	-,101	,041	,404	-,437	-,289	,185	5,396

a. Dependent Variable: AGE

Looking at the t statistic values, we can see that the value for the Interest Rate shows a non significant contribution, so this variable should be discarded from the model. After this, the model equation expressing the relation between the dependent variables and the average age of vehicles, appears as follows:

$$\text{Average Age} = 21.968 + 0.0139 \cdot \text{Taxation Burden} - 0.130 \cdot \text{Purchasing Power}$$

The most important factor influencing the average age of vehicles seems to be the purchasing power. Given that the influence of Purchasing Power and Taxation Burden, although different can be assumed has having values within the same order of magnitude, the ratios of their coefficients may express their relative contributions to the dependent variable, i.e. Purchasing Power is circa 9.35 times more important than Taxation Burden to explain average fleet age.

However, it should be noticed that Italy, which is included in the low taxation group of countries, shows a relatively older fleet, which reasoning might not be conveniently reflected here. This “point” is certainly one with very large residual, the high average age being only possible to explain through other independent variables, like for instance the peculiar geographical distribution of income levels.

Stemming from the previous analysis on the impacts of scrappage schemes, it should also be considered such impacts as significant variables to develop a more solid model to explain the average age of vehicle fleets.

Like in the previous assessments, as explained before, the taxation burden here assumed is taken from the Taxation burden indicator build up by *Eurocarprice*, together with *First Boston* and *Credit Suisse*.

Such indicator is in itself reflecting a weighted average of the taxation in each country, thus allowing a better adherence to the real situation, and therefore a better fitness for the simple modelling approach, hereby developed.

3.1.3 European car market

New Vehicles

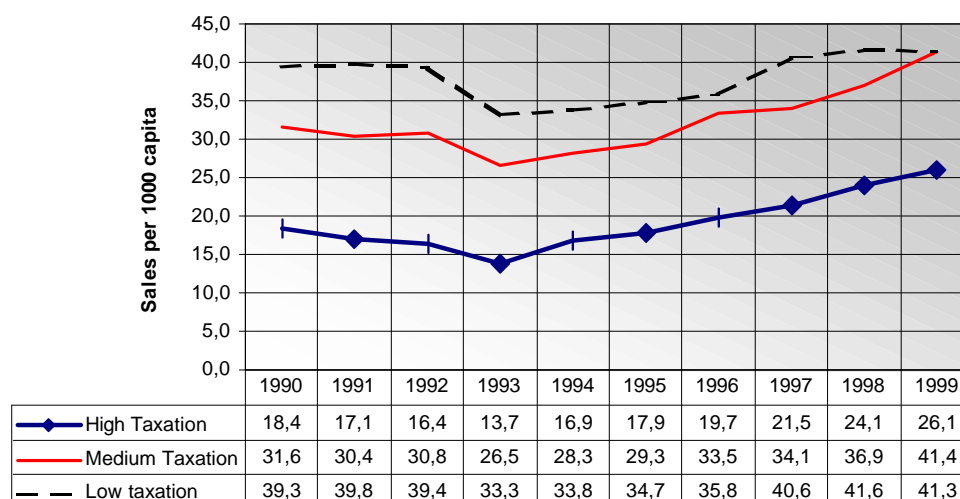
The new vehicles market can be broadly characterised by the sales made within a given time period. This reflects car demand, which is presented in the following table for the last decade.

Table 32- Car Sales per 1000 capita

	DK	FIN	EL	IRL	NL	A	D	I	UK
1990	15,7	28,0	11,4	23,5	33,7	37,5	42,3	40,7	35,0
1991	16,3	18,5	16,4	19,4	32,7	39,1	52,1	39,7	27,6
1992	16,2	13,6	19,3	19,3	32,5	40,7	49,0	41,8	27,5
1993	15,8	11,0	14,3	18,0	25,7	35,8	39,4	29,8	30,6
1994	26,9	13,2	10,5	22,4	28,3	34,1	39,5	29,3	32,8
1995	26,0	15,7	12,0	24,2	29,0	34,8	40,6	30,2	33,3
1996	27,1	18,7	13,4	31,8	30,5	38,2	42,7	30,2	34,5
1997	28,8	20,4	15,2	37,4	30,7	34,1	43,0	41,8	36,9
1998	30,7	24,4	17,1	39,4	34,7	36,6	45,5	41,3	38,0
1999	27,1	26,4	24,8	46,7	38,8	38,8	46,3	40,8	37,0

Sources: OECD, EUROSTAT, and ACEA

Figure 31 – Average Sales per 1000 capita (per Taxation Group) – Evolution 1990-99



Average yearly sales per capita for each of the three taxation groups is hereby compared. According to this chart, it seems quite valid at this stage to raise the hypothesis that at least the taxation burden is somehow related with new vehicle sales.

The relevance of variables other than taxation seems to be arising, given the clear convergence trend, especially between the medium and low taxation country groups. Therefore, the general basic expression enabling to relate new vehicles sales with taxation and purchasing power, should be:

$$\text{Sales} = f(\text{RT}, \text{ACT}, \text{PP})$$

Sales can be strongly dependent on a wide set of circumstantial constraints, such as private consumer expectations. Hence the simple cross sectional analysis trying to relate taxation burden with sales might come out erroneous. The time span of such an analysis should, then, be wider.

However, to do that would have further implications, other long-term variables necessary for such an assessment having to be also included. Opposite to the analysis of vehicle taxation impacts on car ownership (which is an "inventory" variable, thus quite

stable over time), we may have strong variations on the new vehicle sales figures from one year to the other, with no clear connection to fiscal policies. To look at the chart for the time period between 1992 and 1994, where sales fell abruptly, provides a clear understanding about the need for careful analysis. Therefore, the model was specified using the moving average of the last 3 years as the dependent variable, to be explained by the taxation burden, as done before for the impact on car ownership, by using a logarithmic model, aiming to estimate approximated elasticities. The set of variables included in the model to assess taxation influence is hereunder presented. As previously mentioned, the model was run on the logarithms of these values.

The resulting value was then subject to a cross sectional analysis. The fact that we had available a grounded weighted taxation burden index for acquisition taxes (RT+VAT) led us to use such figures for the modelling exercise.

Table 33 - Model Data Set – Impact of Taxation on New Vehicle Sales

	Sales / 1000 cap.	Acq.Taxes (INDEX)	ACT (€car)	PP Index
DK	29	218	422	120
FIN	24	90	186	101
EL	19	36	131	67
IRL	41	61	314	107
NL	35	48	393	115
A	37	31	209	110
D	45	16	183	107
I	41	20	28	103
UK	37	18	276	103

Sales/1000 cap: this is the ratio of new vehicles sold, considering the total population. The sample represents the average for this ration between de years 1997 and 1999.

Acquisition Taxes (index): is the taxation burden (RT+VAT) represented as an average percentage of the retail price (excluding delivery charges). Compares the average car taxation burden imposed in each country. This is the result of a comprehensive weighed average developed by Jato Dynamics Ltd as of June 2001, considering each model and quantities sold, being possible to identify clearly the average percentage of tax applied to passenger vehicles. This indicator is in itself reflecting a weighted average of the taxation in each country, thus allowing a better adherence to the real situation, and therefore a better fitness for the simple modelling approach, hereby developed (Source: Jato Dynamics Ltd.)

ACT: is the ratio between the total revenue (EUR) accrued from circulation taxes and the number of running vehicle (fleet) The sample represents the average for this ration between de years 1997 and 1999. (Source: see Country Reports)

Purchasing Power: index based on the standardised GDP per capita. The sample represents the average for this variable between de years 1997 and 1999. (Source: OCDE)

The following tables summarise the preliminary model results regarding the significance level of the output.

Table 34 - Summary of New Car Sales model results

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	,675 ^a	,455	,377	,2237	,455	5,847	1	7	,046
2	,926 ^b	,857	,809	,1239	,402	16,831	1	6	,006

a. Predictors: (Constant), PPN

b. Predictors: (Constant), PPN, RTN

Using a "stepwise"³⁷ procedure, the software³⁸ was able to withdraw Annual Circulation Taxes from the model, as being non-interesting to explain fluctuations on sales.

³⁷ Iteration Process

Table 35 – New Car Sales model: Stepwise Analysis results

Excluded Variables^c

Model	Beta In	t	Sig.	Partial Correlation	Collinearity Statistics			
					Tolerance	VIF	Minimum Tolerance	
1	RTN	-,653 ^a	-4,103	,006	-,859	,943	1,061	,943
	ACTN	-,339 ^a	-1,166	,288	-,430	,878	1,140	,878
2	ACTN	-,041 ^b	-,205	,846	-,091	,698	1,432	,698

a. Predictors in the Model: (Constant), PPN

b. Predictors in the Model: (Constant), PPN, RTN

c. Dependent Variable: SALESN

Although the fitness of this model ($R^2=0.857$) is not as good as the previous impact assessment made for car ownership, it is still providing enough validity, allowing to broadly assess the extent of taxation impacts.

The average elasticities found were:

	Acq.Taxes	ACT	PPindex
SALES	-0.218	-	+ 1.396

It should be stressed that this elasticity can not be validated from any previous assessment, since we have found no earlier studies on this particular issue. Therefore, this output should remain as merely indicative, at this stage.

- The first remark relates to the fact that taxation on ownership (ACT) does not seem to have any significant direct impact on sales of new vehicles.
- It is noticeable, however, the way in which sales (a 'flow' variable) are inversely depending on acquisition taxes (RT+VAT), almost doubling its effect when compared to the influence of this tax on the car ownership (an 'inventory' variable). This is also very admissible, and from a qualitative point of view it provides indication about which variables associated to taxation are more likely to have an impact on the vehicle market indicators.

Used Vehicles

The distinction made between new and used vehicles with regard to taxation is that a used car starts at 6 months and 6.000 km.³⁹, while a new vehicle may be commercially defined as not yet having been used, excepting short manoeuvres and/or for transport purposes. The mileage reading should not be much more than 200 km and a "day registration", often only for sales purposes, does not automatically change a new car into a used car. A used vehicle in the correct sense of the word can only be defined as a used car if it has been, in fact, used.

Little information could be gathered concerning the second hand market of cars. However, it was possible to understand that the high levels of new car registrations observed in the recent years, shown in a earlier section, have brought an unprecedented number of used cars in to the market.

The most direct consequence of this increased offer of used vehicles is the fall of their equilibrium price.

A study⁴⁰ on the used vehicles market through the analysis of the residual price index was made. The figures presented in the next table show that residual prices of two-year-old vehicles have been dropping in several European countries analysed.

³⁸ SPSS

³⁹ (Art°.28a – Sixth VAT Directive)

⁴⁰ The indicator are published by Eurocarprice.com upon data supplied by Eurotax Glass's.

Table 37 - Second Hand Vehicles Indicators (1st Q – 2001)

Second hand vehicles indicators - First quarter 2001											
Countries	DK	FIN	EL	IRL	NL	A	D	I	UK	Average	Average Euro Currency
Average Residual Value (2 years old) % *	---	---	---	---	71,0%	69,0%	65,0%	62,0%	59,0%	64,0%	---
Change since 1st quarter 2000	---	---	---	---	+ 0,3	+ 0,6%	- 0,2%	+ 0,5%	-3,4%	-1,5%	---
Residual price index #	---	---	---	---	122	118	100	97	128	---	100
Local average Residual Value - last 12 months	---	---	---	---	+ 1,9%	+ 1,6%	- 2,1%	+ 0,6%	- 6,5%	---	-0,9

Source: EurotaxGlass's

* Shows the average residual value as a % of the new car

* Shows the average residual value as a % of the new car

--- no data available

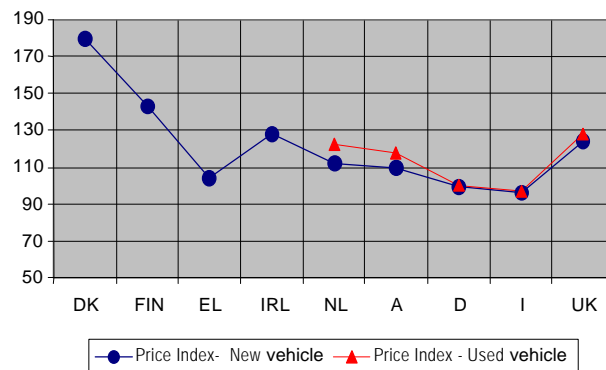
Residual Price index⁴¹: according to the definition provided by Jato Dynamics Ltd and Eurotax Glass, it represents the retail prices of used vehicles based on the percentage of the brand new vehicle price depreciation at 2 years old.

Over the past 12 months (Mar,2001), values have been dropping by an average of 0.9 % in the Euro zone. Second hand car values are weakening fastest in the UK (- 6.5 %). By contrast, values in the Netherlands and Austria rose by almost 2% compared to the beginning of 2000.

On the other hand, the UK has the highest average depreciation rates, where a two-year-old vehicle has a value of 59% of its original price. Italy (62%) closely follows this. The Netherlands (71 %) and Austria (69 %) have the lowest depreciation rates. Across the Euro zone a two-year-old vehicle is worth an average of 64% of its original list price.

The data available does not allow taking any definitive conclusions about the impact of taxation on the used vehicles market. However, taking the data available from the previous table, the price index for used vehicles seems to follow the same pattern detected for new vehicles, as highlighted in this chart using five points of data for used vehicles compared with the new vehicles data (taken from Table 20).

Figure 32 - Price indices - New and Used Vehicles



⁴¹ Retail Price - Manufacturer list price for vehicle inclusive off all taxes, adjusted to specifications (100 models)

3.1.4 Tax avoidance

It was not possible to find relevant statistical information with regard to this issue. However, some countries such as the UK, levying significant taxes on ownership, have been showing some concern, reflected in studies carried out by the National Authorities.

In February 2000 the UK Department of the Environment, Transport and the Regions (Statistical bulletin (00)13) published a report with regard to this issue. The evasion of vehicle excise (annual circulation tax) was measured by directly observing a representative amount of traffic on various roads and recording licence plate numbers for comparison with official registry data. The data was then extrapolated for a total country estimate. The results of the study show that approximately 2.3 % of private and light goods vehicles are not registered and so avoid paying Vehicle Excise Duty (VED). In 1994 this number for the same category was estimated to be 3 %. This number varies in the regions examined and by the time of day and day of the week. A loss of £ 135.1 million was estimated to be the total revenue loss for private vehicles and light goods vehicles. For all road vehicles the total revenue loss was estimated to be £ 183.3 million. As can be quickly seen from these figures, the revenue loss from unlicensed vehicles is mainly from private cars and light goods vehicles. Between 1994, the time of the last survey and 1999 the number of unlicensed cars and light goods vehicles had decreased, but due to the raise in the average cost of licences, the total revenue loss had increased by almost 11 %.

In order to decrease the likelihood of vehicle owners not registering their cars and in order to save the registration fee, the Driver and Vehicle Licensing Agency (DVLA) will install a network of mobile cameras that can detect, record and compare the registration marks of vehicles with the official registry of vehicles.

3.1.5 Identification and Assessment of Barriers to the Internal Market

For the 9 countries in the analysis, this section qualitatively identifies the barriers to the realisation of the internal market such as cross-border obstacles and double taxation problems. Subsequently, the societal costs arising from these barriers are quantified as adequately as possible. Finally, the results are extrapolated and generalised to the other countries in the EU.

The necessary information and data for the analysis has been collected through a key informant survey. In the nine countries that were included in the study, a questionnaire has been sent to organisations that have relevant involvement with regard to vehicle imports and export or that were expected to be able to provide necessary data for the quantification of societal costs. This concerned organisations such as customs authorities, authorities responsible for vehicle registrations and admittance, statistics agencies, importers, representative organisations of importers and car dealers, ministries of finance, consumer organisations (for complaints), etc.

- Identification and analysis of barriers to the internal market

The qualitative identification of barriers to the internal market has been realised by an accurate and detailed description of all steps to be taken for the private de-registration/exportation and subsequent importation/registration of a new or second-hand car in the nine countries. This has taken account of physical requirements and expected delays with regard to documents, technical tests, payment of taxation, license plate, etc., and the associated costs (time and money) involved for a citizen and national administrations.

- Car de-registration and exportation

Basically, citizens can export their vehicle without informing national institutions. The disadvantage however is that the obligation to pay circulation taxes continues so that citizens are generally advised by the vehicle registration authorities to properly de-register their vehicle. This implies that the registration documents are invalidated and that license plates have to be handed in. The following table gives an overview of this "proper" de-registration procedure. It indicates the number of parties involved, the number of documents required, the number of institutions the citizen has to contact, the number of institutions the citizen has to visit physically and the actual presence time for the citizen.

Table 38 - Citizen workload for vehicle de-registration

Car registration procedure: exportation of vehicles					
Country	Number of parties involved	Number of documents required	Number of institutions to contact	Number of institutions the citizen must physically visit	Actual presence time for the citizen
Austria	5	11	5	?	1 hour
Denmark	2	2	1	1	?
Finland	2	2	1	1	Few minutes
Germany	2	10	2	2	1.5 hours
Greece	2	4	2	?	1 day
Ireland	?	?	?	?	?
Italy	1	3	1	1	?
Netherlands	1	3	1	1	1 hour
UK	2	2	2	1	?

The procedures for vehicle exportation appear to be relatively simple. In general only a few parties are involved, few documents are required, and the citizen's time requirements are limited. In most countries de-registration takes around an hour to complete. The major exception is Greece where it takes a citizen a whole day (presence time) to get the vehicle de-registered.

The direct costs involved, including the costs of temporary license plates (but excluding insurance) in order to be able to drive the car to Member State of destination after de-registrations, are indicated in the following table:

Table 39 - Direct costs for vehicle de-registration

Car registration procedure: costs for exportation of vehicles					
Country	De-registration fee	Temporary road permit	Other costs	Explanation	Total costs (amounts in EUR rounded)
Austria	0	0	0		0
Denmark	No information available	No information available	No information available	No information available	No information available
Finland*	45 FIM	60 FIM	0		105 FIM (EUR 18)
Germany	11 DM	85 DM ("International Registration")	30 DM (min)	Export license plates	126 DM (EUR 64)
Greece	< 4.000 GRD	-	-	-	< 4.000 GRD (EUR 12)
Ireland	-	-	-	-	0 (EUR 0)
Italy	-	-	-	-	-
Netherlands	-	22 NLG	-	-	22 NLG (EUR 10)
UK	N/A	N/A	N/A	N/A	N/A

The table shows that the direct de-registration costs are limited for most countries. Since these costs are often fees based on administrative costs, the system can be considered to work efficiently. It should be noticed that the information concerning the UK could not be clearly obtained.

Already paid circulation taxes are sometimes reimbursed at the moment of de-registration. This depends on whether restitution is related to a car ownership transfer within a country and also on the national system for circulation taxation. In some systems circulation tax is linked to the vehicle so that the new owner of a second-hand vehicle may seize the already paid remaining months of circulation tax (paid by the previous owner). While on other systems, circulation tax is related to the period of ownership, where proportional reimbursement occurs, accordingly. In the first type of system, compensation will generally not take place in case of de-registration. Registration taxes are without exception (in the countries that have those taxes) non-reimbursable. The following table provides an overview of the circulation and registration tax reimbursement procedures for the 9 analysed countries:

Table 40 - Tax Restitution when de-registering vehicle

Country	Restitution of taxes when exporting vehicle	
	Registration tax	Circulation tax
Austria	No	No
Denmark	No	No
Finland	No	No
Germany	Not applicable	Yes
Greece	Not applicable	-
Ireland	-	-
Italy	-	-
Netherlands	No	Yes
UK	Not applicable	-

- Vehicle Importation and Registration

For the importation and registration process, similar tables can be constructed. The following table gives an overview of importation and registration requirements, indicating the time it takes to learn the procedure, the number of parties involved, the number of documents required, the number of institutions to contact, the number of institutions to visit and the actual time spent by the citizen.

Table 41 - Citizen workload for vehicle registration

Country	Car registration procedure: importation of vehicles				
	Number of parties involved	Number of documents required	Number of institutions to contact	Number of institutions the citizen must physically visit	Presence Time
Austria	5	6	5	?	1 hour
Denmark	5	2	4	4	?
Finland	3	5	2	2	2 hours
Germany	5	9	7	5	1.5 hours
Greece	2	8	2	2	?
Ireland	1	1	1	1	30 minutes
Italy	3	9	2	1	?
Netherlands	3	7	4	3	9 hours
UK	2	2	2	1	?

This shows that importing a vehicle is more complicated than exporting a vehicle. More parties are involved, on average a larger number of documents has to be submitted, and time consumption is higher as well. The different types of documents (in different combinations and forms) that are needed are: proof of identity, registration form, (temporary) registration documents, (temporary) insurance certificate, proof of age and origin of the car through certificate of newness, bill of sale/invoice and/or foreign registration, technical test certificate, proof of import method, certificate of conformity, payment of vehicle taxes, license plates. In all cases, the importing person will have to show documents that prove the origin of the vehicle. Some countries, like Germany reported an apparent non-proportional time spent in car registration procedures, considered the number of different institutions to contact and the number of documents to be submitted.

Nevertheless, the 1.5 hours mentioned give the average combined time for the citizen spent in the registration offices. The time needed for obtaining forms and filling out any necessary forms is not included in any of the country estimates. The procedure in Germany can be considered to be "user friendly" and straight forward,. However, it can be mentioned that the reported maximum amount of time experienced for the registration or deregistration of a vehicle was 6 weeks. This is taking the whole procedure from the first contact with authorities in the department of motor transport to the final notification from the department of taxation into account.

The following table indicates the direct costs associated with the importation of a vehicle. It includes the costs of all arrangements to be made for registering the car and obtaining all required documents, but excludes the payment of circulation and registration taxes.

Table 42 - Direct costs for vehicle importation

Car registration procedure: costs for importation of vehicles					
Country	Registration fee	Temporary road permit	Other costs	Explanation	Total costs (excl car tax)
Austria	1500 ATS	N/A	N/A	N/A	1500 ATS
Denmark	800 DKK + 25% VAT			All costs are within the 1.000 DKK fee	1.000 DKK (EUR 134)
Finland	45 FIM	60 FIM	250 FIM, 60 FIM	Registration inspection, license plates	415 FIM (EUR 70)
Germany	20 DM + 80 DM + 107 DM		300 DM, 30 DM	Registration inspection, license plates	537 DM (EUR 274)
Greece	0	Car can be operated with foreign plates for one month	8.000 GRD, 28.000 GRD	Technical test, license plates	36.000 GRD (EUR 106)
Ireland	-	-	-	.	Variable
Italy	292.000 ITL minimum per new owner registration		261.800 ITL	Includes a.o. number plate fee, various stamp fees	553.800 ITL minimum (EUR 286)
Netherlands	21.50 NLG	22 NLG	225 NLG, 99.17 NLG, 60 NLG	Car test, license plates	428 NLG (EUR 194)
UK	25 GBP		155 GBP, 62 GBP, 34 GBP	Taxation fee, mutual recognition certificate, MoT test result	276 GBP (EUR437)

In a number of countries the imported car needs to undergo a technical test. This test is either similar to regular (annual) tests that applies to the national vehicle fleet or more demanding and, consequently, also more expensive. Hence, reciprocity in the acceptance of technical tests of other Member States is not always the case.

- Information provision and transparency

The availability of necessary information for both the exportation and the importation of a vehicle strongly differ among Member States:

Table 43 - Information availability for vehicle exportation and importation

Country	Vehicle exportation		Vehicle importation		Remarks
	Time	Written information in variety of languages	Time	Written information in variety of languages	
Austria	1 hour	?	1 hour	?	
Denmark	> 8 hours	No	Several hours	Yes	Importation: limited information on internet in English only
Finland	1 hour	No	1 hour	Yes	
Germany	< 1 hour	?	< 1 hour	?	
Greece	Several hours	No	Several hours	No	For importation, information tends to be "tricky" and sometimes confusing
Ireland	?	?	One hour	Yes	Variety of languages on internet and in brochures
Italy	Up to a couple of days	No	Up to a couple of days	No	Only speaking (for example) English, nearly impossible to collect the information required
Netherlands	One hour	Yes	Few hours	Yes	Information on internet in Dutch and English
UK	1 hour	No	1 hour	No	

For some countries, such as Finland, Austria, Germany and the Netherlands, the information is easily available (through the provision of information leaflets, internet and telephonic consultations) and it does not take much time to learn the procedures for exporting and importing. In any case, the information is available in the local language. For other countries, like Italy and Greece, it is very difficult to find the correct information and to find it in a comprehensible form. It is often suggested to seek help from a native speaker or even specialised agencies. Besides, especially the import/registration procedures between countries differ to a large extent and can be rather complex (esp. Greece).

This situation creates some intransparency for the European citizen and increases the risk of not having all the right documents or doing something wrong with a direct implication on the time it takes to complete the whole procedure. This intransparency creates a psychological barrier to import a vehicle in an unknown country despite the rather low time and direct costs involved. The large numbers of parallel imports in different countries and the reactions of parallel importers show that the administrative import requirements do not need to be a barrier. Once you know the procedure, the whole process works efficiently, smoothly and at low costs. However, for someone who imports a car once in a lifetime, the procedure can become quite frustrating. Even if it can take less than 1 hour, if following optimized procedures (see above table) the citizen will have to find the right information source. For finding out information on the entire procedure of exporting a vehicle from one Member State and importing it into another, on average the citizen should expect to require one full working day at least. This barrier may explain the common practice that European citizens sell their car in the country of origin and buy another one (new or second hand) registered in the country of destination. They simply do not take any risk and choose for this cheap and effective solution.

Direct costs only become considerable in case of double taxation. The main rule in countries that levy registration taxes on cars is that cars at import have to pay registration taxes (again). These registration taxes take in various ways the depreciation of cars into account so that only a fraction of the original registration tax (of a brand new car) has to be paid. Some countries have a partial (Greece) or complete (Netherlands, Finland - up to a certain value of the car) exemption from the obligation to pay registration taxes. This exemption applies only to citizens from other Member States that take their car along in changing their place of residence into the respective country (i.e. car is part of the 'removal' goods). Irrelevant for

this exemption is the country of first registration, i.e. whether registration tax has been paid before. However, a number of conditions apply such as that the car should be older than 6 months, have driven more than 6,000 kilometres and can not be resold within the first year after importation.

Naturally, circulation tax has to be paid from the moment of registration of the imported car.

Table 44 – Registration taxes when importing a vehicle

Country	Structure of the tax	Exemption when importing car as part of removal good
Austria	Basis for the tax: value and fuel specific consumption. The tax may not exceed 16% of the invoice price.	Unknown
Denmark	New: 105% of the price up to DKK 53.000, then 180% of the price over DKK 53.000. Older cars: reduced rates apply, e.g. for a car over 5 year old: 105% of DKK 7.740, then 180% of the balance. The basis for the tax is an estimate of the value of the vehicle.	For second hand cars imported as removal goods, no VAT has to be paid only the registration tax
Finland	100% of the price paid, the result is reduced with 4.600 FIM (an additional FIM 4.900 may be reduced for safety equipment and catalyst). For older cars, the tax is reduced with 0.6% for the first 100 months, then with 0.9% of the remaining value after each of the next 100 months and by 0.4% for the rest of the period remaining. Taxes are subject to VAT.	Yes, tax reduction of FIM 80.000 (about equal to the tax for a medium sized vehicle) if conditions are met
Germany	Not applicable	Not applicable
Greece	Basis for the tax: value, engine capacity, vehicle price. The tax is reduced when the vehicle is older when imported (e.g. 21% reduction of a car 2-3 years of age, 67% reduction for a car more than 10 years of age)	Unknown
Ireland	Basis of charge: retail price and engine capacity. Rates are between 22.5% and 30% depending on engine capacity. For second hand cars, the tax is calculated on the basis of the open market selling price of a similar vehicle. A minimum of 250E applies	Both the amount of tax assessed on a vehicle and the refusal of exemption and repayment may be appealed under the Excise appeals procedure. Appeals against the OMSP assigned to a vehicle should be made in. In such cases the VRT must be paid before the appeal can be considered..
Italy	Basis of charge: fiscal horsepower (on each change of ownership): 292.000 ITL for cars up to 53 KW and 6.800 ITL for each additional KW. Depending on the province, the total tax may be up to 20% higher.	No
Netherlands	Registration tax is 45.2% of the net list price, the result of which is reduced by NLG 3,394 (NLG 722 diesel cars). The older the vehicle, the lower the registration tax (3 years of age: 57% reduction, 9 years of age: 90% reduction).	Yes, complete exemption if conditions are met.
UK	Not applicable	Not applicable

- Cost estimation due to internal market segmentation

The costs associated with the barriers to the importing of a vehicle are twofold. On the one hand there are administrative and enforcement costs involved. On the other hand the European citizen incurs costs (money and time) when going through the de-registration/export and import/registration procedure.

Administrative costs

For none of the nine countries, it has been possible to obtain data from the various institutions/administrations that are involved in the process of car (de-)registration with respect to the costs of administrative transaction and enforcement. These costs were either not available on an aggregate level or could not be isolated from other tasks or services by the same organisation/administration.

However, the registration offices, technical test centres, etc. are mostly non-profit, non-subsidised and operate on the basis of fees for services rendered that in principle reflect their (integral) costs. Hence, administrative costs of

the system becomes apparent from the level of registration fees, costs of technical tests, etc. multiplied by the number of exported and imported cars. However, these costs are already incorporated in the calculation of the costs (part of which are the prices/fees paid) that European citizens incur when going through the de-registration/export and import/registration procedure.

Costs to the European citizen

Societal costs have only been estimated from the perspective of the free movement of the European citizen. The costs to the European citizen, incorporating administrative costs, can be calculated by aggregating the private costs for exporting/importing a car for every citizen when moving place of residence from one country to another. Since registration offices do not keep any information on the number of vehicles that citizens from other Member States import into the country, it is only possible to give a rough estimation of the societal costs involved based on the total number of immigrants from other Member States into a country. This estimation is calculated as an upper limit to the societal costs involved as immigrants often choose for the cheap and effective solution of selling the car before moving to another Member State.

An upper limit to the number of cars that are imported can be estimated at the total number of immigrants from other Member States multiplied by the average car ownership per inhabitant, but this clearly may be far above the real value (such rationale assumes that the average car ownership of migrants is equal to that of the general population, and also that there is no disincentive to take their car along when moving, which we have already stated not to be the case). This data can be found in the next table.

Table 45 – Intra-EU migration movements and car ownership

Country	Number of emigrants to EU-15	Number of immigrants from EU-15	Car ownership per 1.000 inhabitants, 1999
<i>Austria</i>	18.313	17.727	495
<i>Denmark</i>	14.638	17.007	353
<i>Finland</i>	6.463	5.463	408
<i>Germany</i>	197.969	180.432	516
<i>Greece</i>	not available	4.121	253
<i>Ireland</i>	17.000	28.100	360
<i>Italy</i>	24.289	20.296	555
<i>Netherlands</i>	29.695	33.495	408
<i>UK</i>	70.000	92.000	456
<i>Spain</i>	not available	22.047	
<i>Portugal</i>	7.185	1.867	
<i>Sweden</i>	15.239	11.887	
<i>Belgium</i>	not available	not available	
<i>France</i>	not available	not available	
<i>Luxembourg</i>	not available	not available	
Total (9 countries in study)	378.367*	398.732	
Total	400.791 **	434.533***	423****

* excluding Greece

** excluding Greece, Spain, Belgium, France, Luxembourg

*** excluding Belgium, France, Luxembourg

**** EU-15

source: Source: ACEA, EUROSTAT (see p. 12 intermediate report, revised edition)

From the above table, it can be concluded that for the 9 countries in the study, in 1997 some 399 thousand citizens from Member States emigrated from one Member State and immigrate in another.. Since on average EU citizens own 423 cars per 1.000 inhabitants, the maximum number of cars that is exported and imported among Member States included in the study is 169 thousand.

The costs for the citizen moving place of residence and taking the car along are taken to be a rough average (for the countries involved) of the sum of payments and the time required (for learning and executing) the procedure multiplied by an average value of time. The average costs for car importation amount to EUR 214, the average costs for car exportation amount to EUR 17. Thus, the average fee for car exportation and car importation amounts to EUR 231. Taking time consumption into account for the complete procedure of vehicle exportation and importation the citizen should at least reserve 12 hours to collect information and make the arrangements. Using the valuation of time of EUR 10 per hour, the time costs of vehicle exportation and importation between Member States on average thus is EUR 120. Together with fees amounting to EUR 231, the total costs are EUR 351. Multiplying these costs with the number of 169 thousand yields a total of EUR 59 Mio. annually as a proxy for the societal costs from having a segmented car market.

It must be noted that this calculation is based on highly aggregated data and merely gives a rough impression of the societal costs involved from the perspective of the free movement of the European citizen.

Extrapolation of results

The proxy for societal costs can in a similar way be extended for the whole EU. The nine chosen countries for the analyses can be considered representative for the EU as a whole. Given a clear tendency/similarity with respect to required time and money costs in those countries, a social cost calculation for the EU simply requires the replacement of the total number of immigrants from other Member States for the nine countries involved for the total number of immigrants in the EU. Since the immigration data for France, Belgium and Luxembourg are not available, we are only able to extrapolate the results to Spain, Portugal and Sweden. This extrapolation generates social costs of EUR 65 Mio.

Also some other general qualitative intuitions can be deduced that can be expected to be valid for the EU as a whole:

- ***The costs of de-registration and registration are rather low and, consequently, hardly constitute a barrier to the functioning of the internal market (free movement of persons)***
- ***Only for a few Member States the necessary information for importing a vehicle will be easily available, being comprehensive (covering a logical sequence of all steps to be taken) and easily understandable (in different languages)***
- ***Especially the import procedures are complex and are quite different between Member States***

3.2 Impact on Consumers. (Economic and Social Costs)

3.2.1 Lack of transparency within national vehicle taxation systems

The following countries were studied within the key informant surveys: Austria, Denmark, Finland, Germany, Greece, Ireland, Italy, Netherlands and the UK. These countries are valid for the whole of the EU because they represent an entire range of low, middle and high taxing countries.

Information on an European Level

Under the internet address: <http://europa.eu.int/scadplus/citizens/en/inter.htm> the European Union (Dialogue with Citizens) offers first and good information for citizens who want to be aware of their rights and responsibilities regarding private transportation within all countries of the EU. This information was found to be relevant, up to date and was presented in all European languages. In many cases exact information regarding the process and costs of registration for new, second hand and imported vehicles was given in detail. In all countries, contact addresses or internet links were available for further information.

Table 46 - General information available from Dialogue with Citizen

Country	Comprehensive data	Contact address only
Austria	X	
Denmark		X
Finland	X	
Germany	X	
Greece	X	
Ireland		X
Italy		X
Netherlands	X	
UK	X	

For those citizens with no Internet access, this information is naturally difficult or impossible to obtain. Studies about Internet access repeatedly show, that Internet is not available for the population as a whole in any country studied within this report.

Table 47 - Internet acces

Country	Watershed Partners % of Population that use internet
Austria	16.9
Denmark	33.7
Finland	59.3
Germany	20.7
Greece	Less than 1%
Ireland	14.5
Italy	7.2
Netherlands	23.9
UK	33.2

These figures are from a study carried out in 2001. Even if some of the low values seem excessive (considering for instance the percentages of population attending University and working in the modern tertiary sector), it indicates that there is still great diversity in the penetration rates of the Internet in the countries studied within TAXUD. With the exception of Finland, the rate of access to the internet was well below 50% of the population. It should also be noted, that English is the dominant language used in the internet, which also can be considered to be a constraint.

Information on an National Level

The data availability on a national level is compiled from a subjective estimation of the study on vehicle taxation as carried out by the partners in TAXUD. At a national level, information was generally available only in the national language(s). The language barrier could be considered to be a constraint for citizens wanting information for a country where they do not speak the national language. A subjective appraisal of the available information shows that only in Greece and Italy is the available information confusing and difficult to understand.

Table 48 - Data availability on a national level

Country	Data availability	Comments
Austria	Good	
Denmark	Good – middle	Difficult to obtain official data in foreign language
Finland	Good	Difficult to obtain official data in foreign language
Germany	Good	Difficult to obtain official data in foreign language
Greece	Less than good	Data difficult to understand, no data available in foreign language
Ireland	Good	
Italy	Less than good	Data difficult to understand, no data available in foreign language
Netherlands	Good	
UK	Good	

Costs due to problems with transparency in the registration process

- (i) **New vehicles:** in the case study countries the car dealers register the vast majority of new vehicles. This means that there are no time costs for the citizen. The only problem that is associated with this procedure is that the actual amount of taxation and registration fees within the vehicle price may not be completely transparent to the citizen.
- (ii) **Second hand vehicles:** the registration of second hand cars is generally carried out by the citizens and therefore gives a good comparison of the time and effort involved. If the second hand car is purchased at a car dealer, the registration procedure may be carried out by the handler, effectively reducing the citizen time cost to almost zero. For the registration of second hand vehicles by the citizen in the countries studied, time costs were the main costs identified. The registration of second hand vehicles takes between a few minutes and approximately one day for the citizens living in the countries where this study was carried out. This time represents the time needed for the citizen to actually be present at an official office, such as the department of vehicle registration. It should be noted, that the processing of necessary papers and issuing of final documents may take up to 6 weeks or longer.

An estimation of the total social costs to citizens cannot be assessed, as the number of newly registered second hand vehicles was not available. This data is not routinely statistically collected in any of the countries studied. The time costs, however, can be considered to be low when compared to the overall costs of the vehicle.

3.2.2 Tax Refunds and Double Taxation

No bilateral agreements with respect to double taxation were identified within this study. The issue of double taxation and tax refunds has already been discussed in more detail on previous section 3.1.5 - *Identification and Assessment of Barriers to the Internal Market*

3.2.3 Tax evasion

The use of unregistered vehicles is reported to be a problem in Greece. There is a documented incidence of citizens registering their cars in a neighbouring country and using foreign number plates to avoid taxation. The forging of registration documents is also reported to be a problem. No quantification of these tax evasion procedures could be made within the case study.

In Ireland, commercial vehicles are taxed at a lower rate. To qualify as a commercial vehicle, the car may not have more than two seats. Tax evasion, in the form of registering a vehicle as a commercial vehicle and then installing back seats, is a documented form of tax evasion. The number of incidents pertaining to this practise is unknown. The loss of taxation revenue based on this practise is also unknown.

In the UK, the avoidance of paying annual circulation tax has been studied intensively. 2.3% of all vehicles are estimated to running without registration. This estimate also includes agricultural vehicles and goods vehicles. It is estimated that the revenue loss is 217 million ECU for cars and vehicles under 3.5 tonnes total weight. No other quantified tax evasion studies have been completed for the remaining countries considered within the case studies.

3.2.4. Scrapping Schemes and Abandoned Vehicles

- (i) **Scrapping schemes:** No scrapping schemes in the traditional sense are presently in use in Europe, however in Denmark and in the Netherlands a disposal premium is paid out to encourage the environmentally sound disposal of vehicles. The premium are funded by a mandatory payment added to the price of a new vehicle and by the recycling industry in both. In both countries the aim of the scheme is to encourage an environmentally sound method of vehicle disposal rather than the renewal of the fleet. In Denmark, a disposal premium of DKK 1200 is paid by the Ministry of Tax and Customs to cover the cost of vehicle dismantling and recycling or disposal. The average age of vehicles disposed of in this manner was approximately 14 – 18 years of age. 70000 premiums were paid out in 2000. A total of DKK 36 million has been paid out with in this scheme. In the Netherlands, 286000 vehicles were scrapped in the year 2000, resulting in the paying out of premiums that amounted to NGL 42.2 million. The average age of these vehicles was 14.3 years.
- (ii) **Abandoned Vehicles:** it was not possible to establish a clear link between high rates of tax and abandoned vehicles along this study. No statistical data about the number of abandoned vehicles is recorded centrally in any country within this study. In none of the case studies, where information was available, were abandoned vehicles considered to be a problem. It should be noted, that in Greece, where the number of abandoned vehicles is assumed to be high, no specific information was available. The costs for the removal and disposal of abandoned vehicles are highly dependant on the city or municipality responsible for the identification, collection and disposal of abandoned vehicles. There is no indication that citizens illegally abandoning their vehicles are routinely heavily fined.

3.2.5. Weight of taxes in the purchasing power and associated equity issues

It is difficult to assess equity issues surrounding the taxation of vehicles in Europe as vehicles are not considered to be a truly essential good. Nevertheless we were able to combine the base price, the taxation burden and the purchasing power indicator, in a rough assessment on how taxation is distorting equity levels amongst the European countries in previous section 3.1.1 – *European Citizens*. From the citizen's viewpoint, different levels of vehicle taxation within the European community may be considered to be significant. In the course of this study, it has become clear that variations on the base price are managed by the industry to compensate the level of taxation, thus smoothing the differences in the final retail prices across Europe. This means, that a vehicle generally has a lower base price in a high taxation country and that the motor vehicle industry is partially absorbing the differential taxation burden imposed..

3.2.6. Market transparency and the EURO introduction in 2002

Although this was not directly asked as part of the key informant survey, it is estimated that the introduction of the single currency will add to the transparency of the car market. As already can be seen, the citing of vehicle prices and associated costs in EURO within relevant sales magazines leads to easy vehicle price comparisons across Europe. These comparisons will give the citizen an informed basis when considering the purchase of a new or second hand car. It is possible, that parallel imports will increase due to the direct comparison of prices in countries where the vehicle price is high and the taxation relatively low (for example Germany and the UK).

4. EFFECTS OF VEHICLE TAXATION CHANGES

4.1. Methodological issues

4.1.1. Approach and Hypothesis

This chapter will analyse the quantitative and qualitative impacts of taxation policy changes within the car market and its effects on market distortions and social costs addressed in the previous chapters. In a first step, the most important effects of different taxation levels will be modelled based on an in-depth analysis of European car data. In a second step, the identified cause-effect chains will be used to quantify effects of taxation policy changes, addressed in three different taxation scenarios.

The most important aspect and the starting point is the impact analysis on car pre and post tax prices, being the cause for different demand patterns in different countries and for different distribution pattern of car producers and dealers. On that purpose an in-depth regression analysis of a specific European representative data set has been carried out.

The following hypotheses are most relevant:

1. The tax level influences car **pre tax prices** significantly. It is assumed that registration taxes have a more significant impact than annual circulation taxes or fuel taxes.
2. High registration taxes lead to **adjustment behaviour of car dealers**. In high tax countries, they will reduce dealer margins in order to anticipate high post-tax-car (retail) prices.
3. Pre-tax price differentials are influencing **car demand**. High tax countries will face a lower demand for new and old cars;
4. The **second hand market** might have a higher share in countries with high registration taxes, since they mostly have to be paid for new cars, and depreciation is significant in the first years. Here it depends on the difference between the level of registration taxes and circulation taxes. This might lead to a higher average age of the vehicle fleet in comparison with countries with low taxes.
5. Taxation policy changes have a direct and an indirect impact on **tax revenues**. The direct effect depends on the tax levels themselves. The indirect effects depend on the behaviour adjustments on car demand and supply and on tax avoidance incentives.

4.1.2. Model specifications

Based on these hypotheses we can express the following equations being relevant for the model approach. In a first step we model the effects of different taxation levels on pre-tax-prices. This step is similar to the procedure of the approach of Degryse/Verboven (2000), previously mentioned in this report. We will however use a more differentiated approach looking at the impact of different taxes individually.

$$(1) \text{ Car pre-Tax-Prices differences } new_{tij} = f(\text{RT-level}_{tj}, \text{ACT-level}_{tj}, \text{Exchange rates}_{tj}, \text{VAT-level}_{tj})$$

- t = years considered
- i = different models
- j = countries considered

These results can be compared with information on dealer margins by country, in order to have an idea of price adjustment behaviour of the car dealers.

$$(2) \text{ Retail-Price}_{ijT} = \text{Car-pre-Tax-Price}_{ijT} + \text{VAT}_{jT} + \text{RT}_{ijT}$$

$$(3) \text{ Car Demand New Cars}_{ijT} = f(\text{Car Retail-Price}_{ijT}, \text{nat. income}_{jT}, \text{other socio-economic variables}_{jT})$$

$$(4) \text{ Car per 1'000 inhabitants} = f(\text{Car Retail-Price}_{ijT}, \text{nat. income}_{jT}, \text{other socio-economic variables}_{jT})$$

$$(5) \text{ Vehicle age} = f(\text{RT-level}_{tj}, \text{ACT-level}_{tj}, \text{pre-Tax Prices}_{tj})$$

$$(6) \text{ Tax income}_{ijT} = \text{Car Demand New Cars}_{ijT} * \text{tax level}_{ijT} + \text{Car Demand Old Cars}_{ijT} * \text{tax level} + \text{additional fees}_{ijT} + \text{change in tax avoidance}_{jT}$$

4.1.3. The variables and data basis

The model analysis builds up on a special data basis provided by JATO Dynamics (UK). It contains sales prices and number of sold new cars for:

- 20 top selling car models (further differentiated into around 30 car specifications) in the European car market per country, in the years 1999 and 2000,
- 9 countries (Austria, Denmark, Finland, Germany, Great Britain, Greece, Ireland, Italy, Netherlands).

This database is containing 23'000 individual data points in total and is very representative for our analysis. It covers more than 50% of market share. In order to have an applicable set of data, the car specifications were aggregated to car models. Thus in total the data sample contains 335 observations. The other variables are summarised in the following table:

Table 49 - Overview of additional variables used in the model estimations

Variable	Description	Data source
Tax level per brand	Tax level of RT and ACT per model/brand (Tax income per vkm as a weighted reference)	Individually estimated, based on JATO & national information
VAT, Exchange rates	PPP adjusted	National statistics
Pre-Tax Price	Prices per model	Individually estimated, based on JATO & national information
Car demand	Yearly figure of new cars entering the passenger car fleet	National statistics
Fuel consumption	Fuel consumed (litre/100 km)	National statistics or producers information
Nat. income	National GDP (PPP weighted)	National statistics
Age structure	Age distribution of cars	Current EU-research projects (TREN & ARTEMIS)
Tax income	Income of vehicle taxes	National statistics

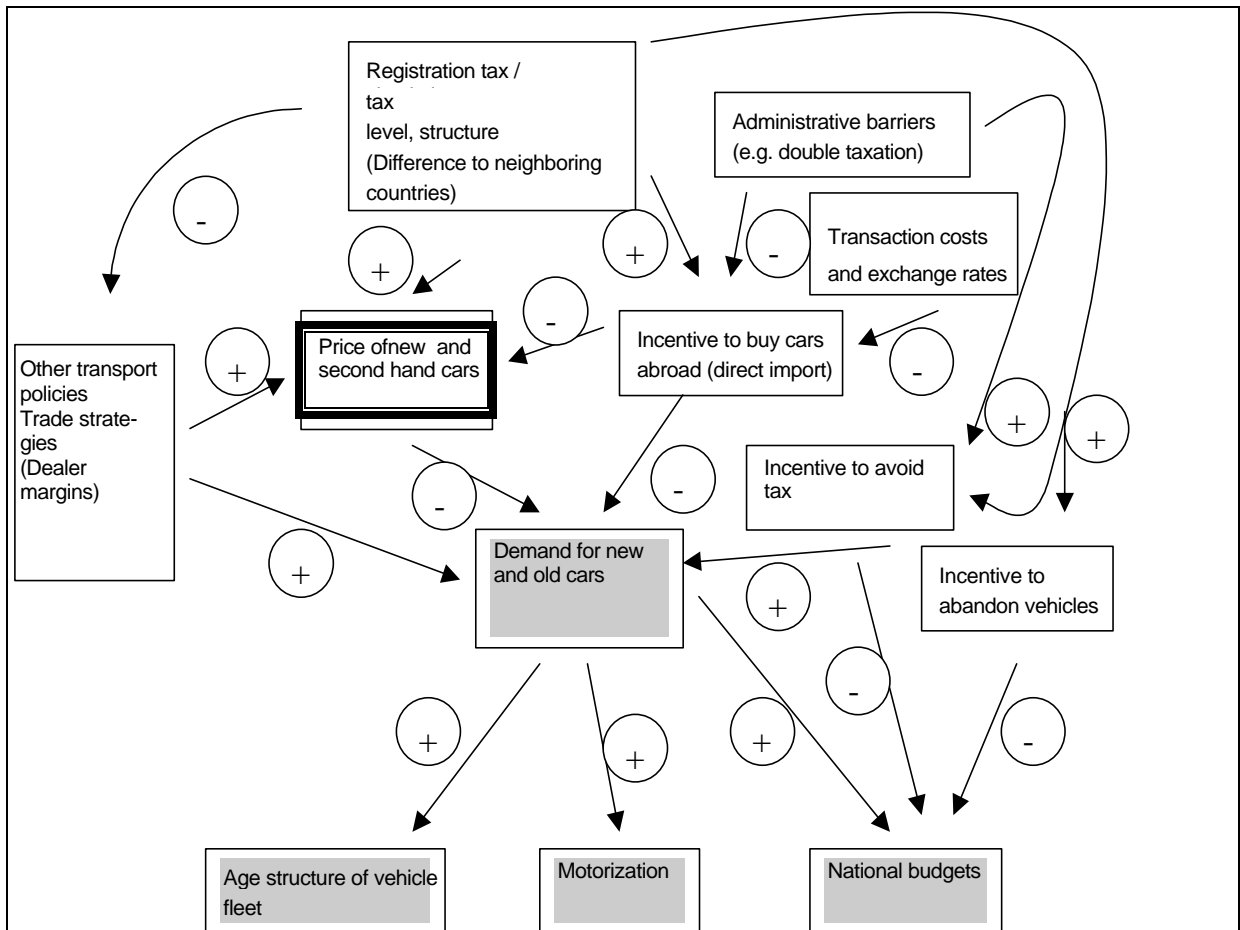
The estimations have been carried out by cross-country regression analysis based on SPSS. In the annex is explained the procedure and the outputs in more detail. It has to be considered that there was no data available for the performance of the parallel market (new cars sold not by official dealers) and of the second hand car market (second hand cars sold by official and parallel dealers).

4.2. Direct and Indirect Impacts of Different Taxation Levels

4.2.1. Overview

The following figure is summarising the most important effects.

Figure 33 - Overview of the most important cause-effect-chains in the car market



The model shows the complexity of demand and supply effects. We concentrate ourselves in the following subchapters on the most important effects (shaded areas in the figure above. The most important input variables are car prices (car price differentials between countries due to taxation differences respectively).

4.2.2. Car Prices

The influence of different taxation levels determines all other effects since car prices are depending directly on tax levels, and the supply and demand equilibrium is related to the car price. As already show, figure 29 illustrates that high taxation countries are facing lower base prices and higher retail prices. This indicates that dealers are adjusting their price strategies according to the different tax levels.

A brief look at the dealer margins (table 22 in Chapter 2) supports these assumptions. The average dealer margin per country (as a rough business performance indicator based on car dealers' information) shows high dealer margins in low tax countries and the opposite for high tax countries.

The model analysis (based on equations (1) and (2) provides the statistical evidence for this hypothesis.

The regression analysis considers all three different tax variables (RT, ACT and VAT) and in addition the GDP per capita as an indicator for the willingness to pay. The results are quite satisfactory, showing that most of the car price differentials can be explained by the GDP per capita and the level of the registration tax. The results are as follows:⁴²

Table 50 - Model results for car price differentials

	Coefficient	T-Value	Significance
Constant	0.133	14.470	0.000
Δ GDP per Capita	0.479	13.588	0.000
Δ Registration Tax	-0.108	-22.641	0.000
Δ Circulation Tax	-0.011	-2.814	0.005
R Square			0.656

Whereas there was no significant influence of the VAT-level all other variables are highly significant. The explanation factor of the GDP per capita is four times higher than the RT-level. Compared to the RT-level, the level of the annual circulation tax is much less important, although a significant influence factor.

This analysis proves the hypothesis that car producers and dealers are differentiating car prices according to demand criteria in different countries and are outweighing (partly) the influence of different taxation levels. With this pricing strategy, car dealers and producers face a trade-off. On the one hand this approach allows the adjustment of demand, on the other hand, different car pre-tax prices in different countries raise incentives for third party dealers to start arbitrage between countries, which is expressed as parallel imports.

4.2.3 Car demand

The previous Figure 31 – “Average Sales per 1000 capita (per Taxation Group) – Evolution 1990-99” illustrates the development of car sales in the last 10 years. That figure provides indication that in the average taxation and in the low taxation countries, new vehicle sales have consistently lower indices when compared to the low taxation countries. Within our model approach, we analyse the impacts on demand of new cars and car ownership in total (equation 3 and 4), since no additional data is available.

The results may be summarised as follows:

- Contrary to what we have seen for aggregate data in chapter 2 (tables 34 and 35), there is no statistically significant impact of tax levels (CTL and fuel tax), expressed as retail price changes) on demand of new cars for the disaggregate data set in the two years under analysis (1999-2000). This might be astonishing at first sight. One has to consider however that the data sample analysed does not include sales of the parallel markets. In addition the data sample does not show a great variety of demand since prices and income levels of the countries considered are in the same range. Thus one can conclude that car demand is fully in line with the car price strategies of the car dealers: Car dealers are anticipating the different willingness to pay of the countries. This can be shown as well (at least partly) by the fact that high price models are sold better in those countries with a high GDP per capita.
- There is a significant influence of retail prices (and thus esp. RT-levels) on the level of car ownership. This is an important finding since the car ownership level includes new cars (sold by official dealers), new cars (sold by parallel dealers) and second hand cars (sold by official and parallel dealers), and takes a cumulative effect over many more years than two considered for the car sales in this study. It can be concluded, that registration taxes are influencing the total of cars used in a country. The table below shows the statistical results:

⁴² The coefficients can be interpreted as elasticity parameters.

Table 51 - Model results for car ownership *

	Coefficient	T-Value	Significance
Constant	-3.987	-8.173	0.000
LN Retail price	-0.108	-4.473	0.000
LN GDP per capita	0.414	8.409	0.000
R Square			
			0.186

(*) -Car ownership is defined as number of vehicle per 1000 inhabitants.

Although the level of explanation (adjusted R²) is quite low, the influence of retail prices is highly significant⁴³. Compared to the GDP per capita however the influence seems to be about 4 times lower. Note that a model for car ownership with a better fit has already been presented in chapter 2 (tables 25 and 26), using the different car taxes (and not retail price) as explanatory variables, besides purchasing power.

As already expressed in chapter 2, little information could be gathered concerning the second hand market of cars. However, it was possible to understand that the price index for used vehicles also seems clearly influenced by taxation levels on acquisition and also that the high levels of new car registrations observed in the recent years, have brought an unprecedented number of used cars in to the market, with the direct consequence of a fall of their equilibrium price.

4.2.4 Vehicle Age and Structure

Comprehensive data on vehicle age in different countries is hard to obtain. We base our analysis (equation 5) on figures of other EU-research projects analysing fleet composition for the purpose of emission modelling. The influence of the tax levels is quite significant, with a high explanation factor, as the following table shows.

Table 52 - Model results for age structure

	Coefficient	T-Value	Significance
Constant	8.080	18.715	0.000
Cost over Lifecycle	2.777	5.632	0.002
GDP per Head	-3.183	-5.379	0.003
R Square			
			0.877

The vehicle cost over the lifecycle represents the cumulative tax of RT and CTL. These costs are similarly important to the GDP per capita, which has (logically) a negative influence.

⁴³ The coefficients can be interpreted as elasticity's

4.2.5 Conclusions

The quantitative analysis shown above has provided a couple of explanatory equations and elasticity parameters which are important for the following scenario estimations. Most important is the influence of different tax levels (especially RT) to pre-tax prices. The findings (expressed as average effects) can be summarised as follows:

<i>A change of the ...</i>		<i>leads to a change of the ...</i>	
• RT (expressed as RT in relation to pre tax price)	-10%	□ pre-tax price	+ 1.1%
• CT/base price (expressed as CT in relation to pre tax price)	+10%	□ pre-tax price	- 0.1%
• Retail price	-10%	□ demand cars per capita	+ 1.1%
• Income rise	+10%	□ demand cars per capita	+ 4.1%
• Increase of CTL and RT (expressed as life cycle costs)	+10%	□ car age	+ 0.28 years

Comparing these results with the hypothesis mentioned at the beginning, we may state that the most important effects were measured confirming the previous results. A rather important finding is that the level of RT is influencing car prices significantly more than levels of CT.

Nevertheless, some equations could not be quantified properly, due to lack of data. The relations to social costs of different taxation levels however can be made in a qualitative sense:

About 20% of European car price differentials can be explained by different taxation levels. This increases the share of car market arbitrage between different countries. The arbitrage markets (parallel import markets) are basically functioning, and arbitrage would also take place without tax differentials, due to different willingness to pay in the different countries. The additional price increase however is causing additional costs in the sense of transaction costs shown in the previous chapters.

4.3. Modelling Budget Neutral Policy Changes

4.3.1. Scenario Characteristics

In order to analyse the impacts of possible policy changes of taxation schemes properly and in a transparent way, we will use the reaction parameters elaborated in the model analysis in a scenario approach. A very important condition hereby is budget neutrality: A change of taxation levels has to be outweighed by other tax changes.⁴⁴ All scenarios are primarily showing changes of the tax structure, and not of the total tax revenues. Thus all scenarios in the first working step are based on the assumption that car demand remains unchanged. Losses in one tax are compensated through another tax assuming the same number of cars as before the tax shift. This means in the first step budget neutrality is guaranteed. But as soon as in a second step of the scenarios a reaction of demand on the changed car prices is admitted, the fiscal neutrality will not hold.

The question is to know, what are the fiscal implications in each country after a reaction of demand on the change in the tax structure. This budget neutrality condition implies as well that the interesting optimisation is the adjustment of the other taxes and the related changes in car prices and car demand, as different vehicle taxes imply different structural changes. The changes of the taxes in the different scenarios are based on the model sample, but have been estimated for the whole vehicle fleet in a country. We considered the following scenarios:

1. **Reduction of registration tax in all countries by 20% with parallel increase of annual circulation tax and fuel taxes;**
 - V1: Assuming that demand remains constant in this first step, the revenue compensation is fully made by an increase of ACT;
 - V2: Assuming that demand remains constant in this first step, the revenue compensation is made half by ACT increase, half by fuel price increase.
2. **Reduction of registration tax in all countries by 50% with parallel increase of annual circulation tax and fuel taxes;**
 - V1: Assuming that demand remains constant in this first step, the revenue compensation is fully made by an increase of ACT;
 - V2: Assuming that demand remains constant in this first step, the revenue compensation is made half by ACT increase, half by fuel price increase.
3. **Approximation of registration tax range and annual circulation tax (for the nine Member States concerned the margin of differences was chosen to be similar to the margin of differences existing in VAT, that is 9%).**
 - Adjustment of the RT-level
 - Adjustment of the RT and ACT-levels (in sum)

It has to be considered that the revenue adjustments are a first round adjustment, i.e. the reductions are not anticipating demand effects. Thus the budget neutrality can only be guaranteed in a second iteration as expressed in chapter 4.3.3.

⁴⁴ The balance of the overall taxes paid for an average car is calculated over an average lifetime of the cars; i.e. the loss in RT are covered by CT of a period of several years. See Chapter 4.3.4 – CTL Sensitivity Analysis.

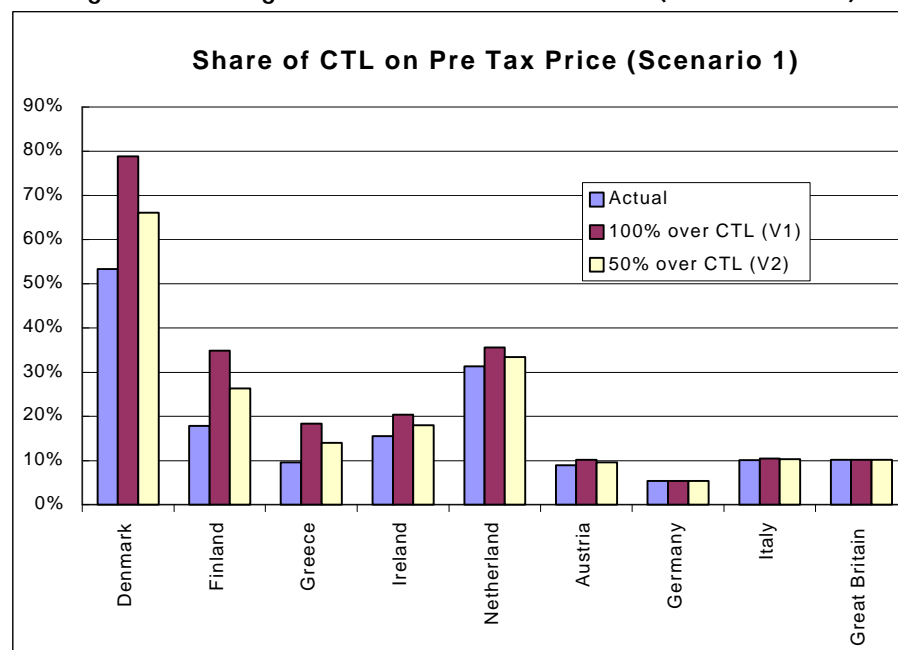
4.3.2. Resulting tax levels

a) Circulation tax

The following figure is showing the changes of the circulation tax for the **Scenario 1**. The reduction of the registration tax will be outweighed by CTL. The CT will increase in Denmark by 47% (from 53% to 78%), in Finland even 96%. If 50% of the tax change will be outweighed by the fuel tax, the changes are 50% lower.

The mechanisms in **Scenario 2** are very similar, but on a higher level. Since the reduction is 2.5 times higher, the effects are as well about 2.5 times more intense.⁴⁵

Figure 34 - Change in CTL-levels within Scenario 1 (Variants 1 and 2)



For **Scenario 3**, it was necessary to model in a first step the effects of the two subvariants considered. The variance of the taxes imposed in this scenario was at 9%, reflecting a situation similar to the VAT applying in the Member States of our sample.

- The first variant allowed a tax range of RT between 21 and 30% of the pre tax price in every country.
- The second variant considered an acceptable level for CTL and RT (fixed at a 9-15% interval of the pre tax prices).

The losses of the RT were compensated half by a rise of the CTL, half by a rise of the Fuel Taxes.

Every model was designed to preserve as many countries as possible without changes, and adapt the other countries accordingly (Countries having no RT are not simulated to introduce an RT in scenario 3). If the range of the tax levels should reflect the variety of VAT-level differentials, the tax changes presented in the following table will result.

If the adjustment should only consider registration taxes, very noticeable changes would be necessary, which are higher than the scenarios 1 and 2. Denmark for example should reduce its RT by a factor 4, whereas Italy should increase the RT level by a factor 10. If RT and CT are considered together, the changes are generally lower (except Denmark which has as well a high fuel tax).

The tax losses will be compensated by a fuel tax increase. It has to be noted however that Variant 2 will lead to considerable changes especially for Denmark and Finland, where overall tax burden should be reduced by 80 to 90%.

⁴⁵ See the detailed results in Annex.

Table 53 - Changes of tax levels in Scenario 3 for different variants

	New tax level in % of today's level	
	Variant 1 (only RT)	Variant 2 (RT and CTL)
DK	23%	8%
FIN	35%	14%
EL	70%	26%
IRL	100%	35%
NL	100%	26%
A	350%	93%
D	-	100%
IT	1050%	100%
UK	-	100%

The following table is presenting the respective fuel tax changes in the Scenarios 1 and 2, for the V2 of each Scenario. The range of changes is rather minor, with the exception of Greece and Denmark.

Table 54 - Change in Fuel Tax Levels

	Scenario 1 V2	Scenario 2 V2	Scenario 3 V1
DK	0.43%	1.08%	760.8%
FIN	0.21%	0.53%	199.8%
EL	1.70%	4.25%	807.8%
IRL	0.51%	1.27%	216.4%
NL	0.17%	0.42%	352.9%
A	0.08%	0.20%	19.1%
D	0.00%	0.00%	0.0%
IT	0.02%	0.04%	0.0%
UK	0.00%	0.00%	0.0%

4.3.3. Impact analysis

a) Price changes

The following figures are presenting the changes of the most important car prices considered. The structure (but not the level) of the changes is in all scenarios similar. Due to the significant impact of the registration tax to price differentials, pre-tax prices will increase slightly (between 2 and 5%),

Actually the highest pre tax price (Great Britain) is about double the lowest pre tax price (Greece). The gap between the pre tax prices in the most expensive and the cheapest country does only change within the different scenarios. The shifts through the different variants in scenario 1 and 2 do only close the gap by 1 to 4%. In scenario 3 the gap is even rising about 10%.

Table 55 : Average Pre Tax Prices and the changes according to the scenarios

	Actual	Scenario 1		Scenario 2		Scenario 3
		Variant 1	Variant 2	Variant 1	Variant 2	
DK	10'231	10'396	10'424	10'644	10'714	11'338
FIN	10'069	10'178	10'232	10'341	10'477	11'158
EL	8'540	8'636	8'680	8'781	8'891	9'463
IRL	12'009	12'226	12'248	12'552	12'605	13'308
NL	12'003	12'244	12'253	12'605	12'628	13'301
A	15'663	15'976	15'989	16'446	16'477	17'357
D	16'982	16'982	16'982	16'982	16'982	18'819
IT	11'771	12'021	12'023	12'395	12'401	13'044
UK	17'316	17'316	17'316	17'316	17'316	19'189
Gap between highest & lowest	8'777	8'680	8'636	8'535	8'425	9'726
Shift of the gap relative actual situation	-	-1.1%	-1.6%	-2.8%	-4.0%	+10.8%

According to the following charts retail prices will be reduced dramatically especially in those countries with high registration taxes, where these reductions are between 10 and 25% (max.). However some countries will face a slight increase due to the fact that VAT, not changed, is still imposed but now upon a base price that is raised by the industry in result of the respective base price adjustments. This slight effect would be probably corrected by considering some further adjustments on the base price, but now caused by the VAT tax itself applied to the increased base price. It is assumed that car dealers are fully compensating the registration tax level changes in their car prices. In reality, the price adjustments might be more complex since there are demand and price reactions. The range of price changes between the countries might therefore be slightly adjusted. This cannot be modelled properly with the available data.

The cost over lifecycle (i.e. the sum of pre tax price, RT, CT for average car life) varies significantly in 5 countries and remains constant in other four (A, D, I, UK). The biggest differences are to be noted in the Netherlands, where the costs for a car over a lifecycle would decrease of 6%, whereas in Ireland a rise of almost 4% would occur.

Figure 35 - Car price changes in Scenario 1 (Variant 1)

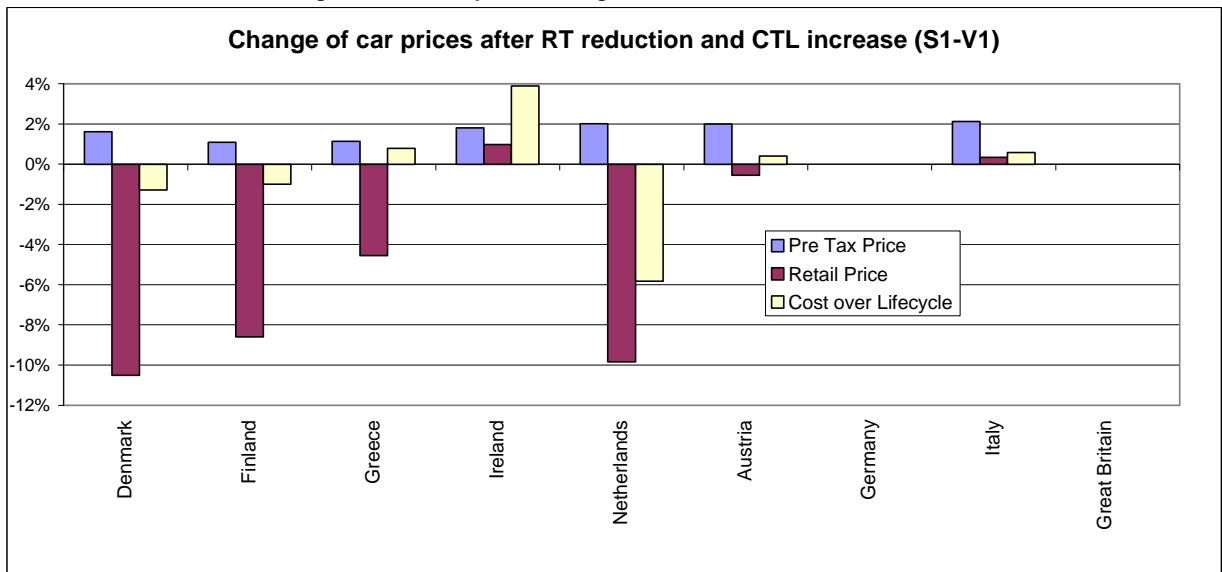
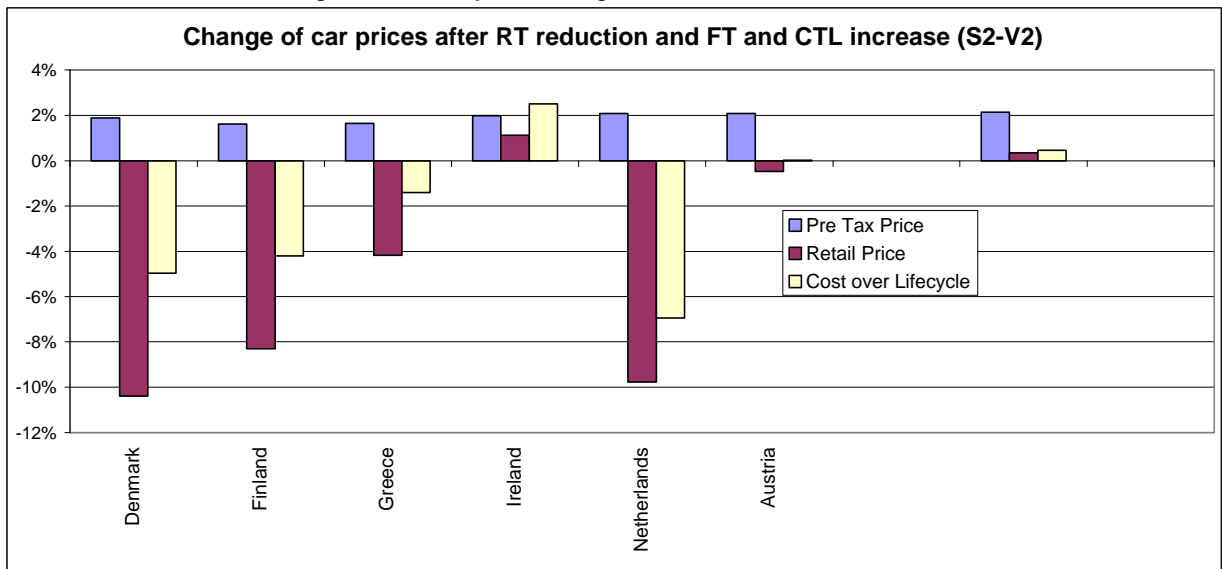


Figure 36 - Car price changes in Scenario 1 (Variant 2)



The changes of scenario 2 are in general about 2.5 times higher than scenario 1, as shown in the following table. However, the effect of the RT changes may vary between countries, as in some countries VAT is levied on RT, but not in others.

The retail price depends mainly on the registration tax (RT) and the pre tax price (and the VAT). Our model states that changes in RT and CT have a positive influence on the pre tax price (call it effect A). The cut in RT has a negative influence on retail prices (call it effect B). For instance, in the Netherlands the taxes and the pre tax price structure are thus, that the global outcome of effect A and B are similar (about 10-12%) in the two scenarios (RT minus 20% and minus 50%). While in Denmark the tax and price structure are different to the Netherlands. The global effect here varies between 10%-27%.

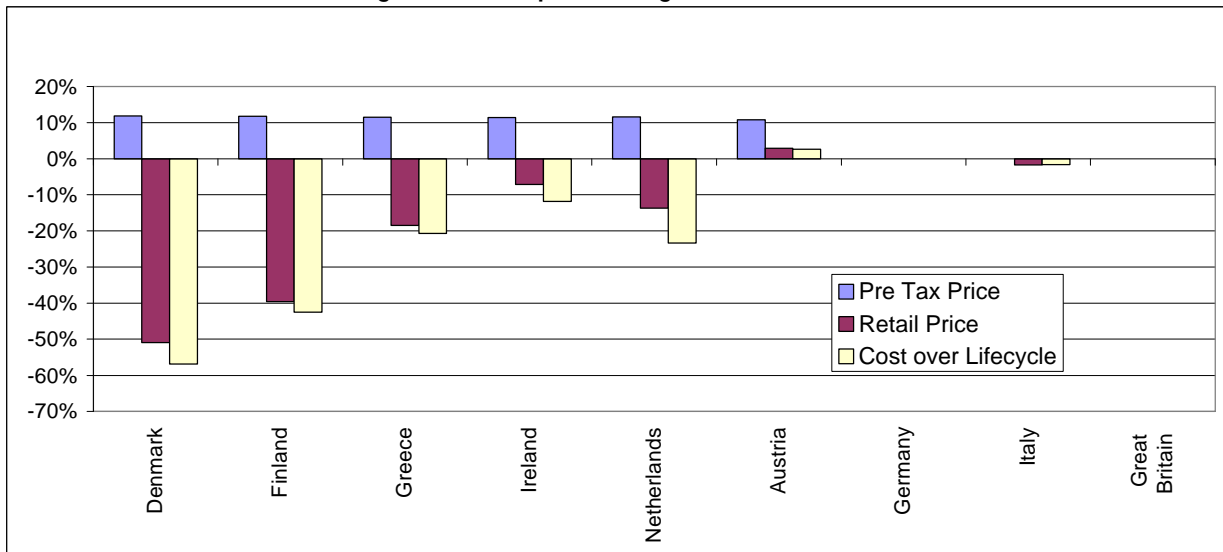
This happens, because in Denmark the RT is about half of the retail price; VAT is levied also on the RT. Changes in the RT will therefore have a major effect on retail prices. In Netherlands the VAT isn't levied on RT, while the RT applying to petrol vehicles is of 45.2% minus a constant amount of 1500 Euro.

Table 56 - Car price changes in Scenario 2

Change of car price in %	Scenario 2 V1			Scenario 2 V2		
	Pre Tax Price	Retail Price	Cost over Lifecycle	Pre Tax Price	Retail Price	Cost over Lifecycle
DK	4.0%	-26.3%	-1.3%	4.7%	-26.0%	-5.0%
FIN	2.7%	-21.5%	-1.0%	4.0%	-20.8%	-4.2%
EL	2.8%	-11.4%	0.8%	4.1%	-10.4%	-1.4%
IRL	4.5%	-2.8%	3.9%	5.0%	-2.4%	2.5%
NL	5.0%	-11.7%	-5.8%	5.2%	-11.6%	-6.9%
A	5.0%	0.5%	0.4%	5.2%	0.7%	0.0%
D	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
IT	5.3%	3.5%	0.6%	5.3%	3.5%	0.5%
UK	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

The changes of Scenario 3 (V2) are shown in the following figure. Especially for Denmark and Finland, the changes are significantly higher than in the other scenarios.

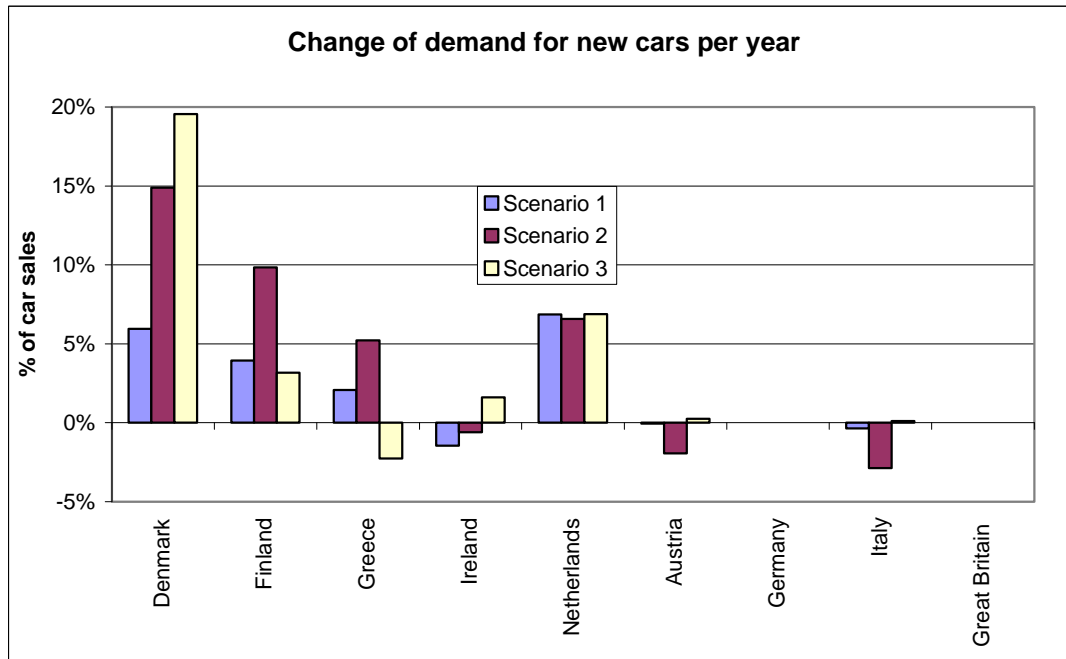
Figure 37 - Car price changes in Scenario 3



b) Car demand

In the first step the demand for new cars was held constant. The losses in RT were compensated assuming that as many cars as before the change in the tax structure pay the adjusted CT that will exactly even up the losses in RT. But as shown in the price equation the car prices (pre tax price, retail price and cost over lifecycle) react on a change in the tax structure. The price changes modelled above will have an influence of car demand. The following figure is presenting the results for the different scenarios. In high tax countries, demand for new cars is increasing significantly, especially in Denmark and Finland. The differences between the three scenarios are remarkable.

Figure 38 - Change of demand (new cars) in the three scenarios



c) Car age

The following table is presenting the changes of car age in the different scenarios.

Table 57 - Average Car age in the three scenarios

	Actual average car age	Scenario 1		Scenario 2		Scenario 3
		Variant 1	Variant 2	Variant 1	Variant 2	
DK	8.5	8.44	8.28	8.36	8.28	6.13
FIN	10.1	10.07	9.97	10.02	9.97	8.92
EL	8.7	8.71	8.67	8.74	8.67	8.44
IRL	7.6	7.70	7.66	7.72	7.66	7.46
NL	7.3	7.14	7.10	7.19	7.10	6.72
A	7.3	7.31	7.30	7.38	7.30	7.27
D	6.8	6.80	6.80	6.80	6.80	6.80
IT	7.8	7.81	7.81	7.88	7.81	7.77
UK	7.2	7.20	7.20	7.20	7.20	7.20

Once again the changes are most significant in scenario 3, especially for Denmark and Finland, where a maximal decrease of 2 years (Scenario 3) can be expected. For all the other countries the changes are minor.

d) Revenues

The following tables are presenting the changes of tax income after the reaction of demand on changed prices. If demand were not reacting on prices, strict budget neutrality would have been achieved, as assumed in the first step of the scenarios.

The results for the fiscal effects below show therefore the deviation from the original tax revenues due to the decline of the RT and the compensation over a higher CT.

As we have assumed, RT and CT changes apply only to new cars. Therefore these tables are expressing the changes in tax income in relation to the current tax income accrued from new cars and not in relation to the tax income in the starting situation from all cars, which would be much less relevant. For this reason the changes shown are apparently huge, as they are not spread over the whole fleet.

Table 58 - Changes of tax income for the different taxes in Scenario 1

Scenario 1	Registration Tax		Circulation Tax		Fuel Tax	
	Variant 1	Variant 2	Variant 1	Variant 2	Variant 1	Variant 2
DK	125%	163%	270%	208%		0.1%
FIN	64%	63%	276%	180%		0.1%
EL	14%	-10%	178%	107%		0.5%
IRL	-34%	-60%	26%	11%		0.2%
NL	80%	58%	91%	79%		0.1%
A	-21%	-47%	19%	11%		0.0%
D						
IT	-25%	-54%	2%	0%		0.0%
UK						

Table 59 - Changes of tax income for the different taxes in Scenario 2

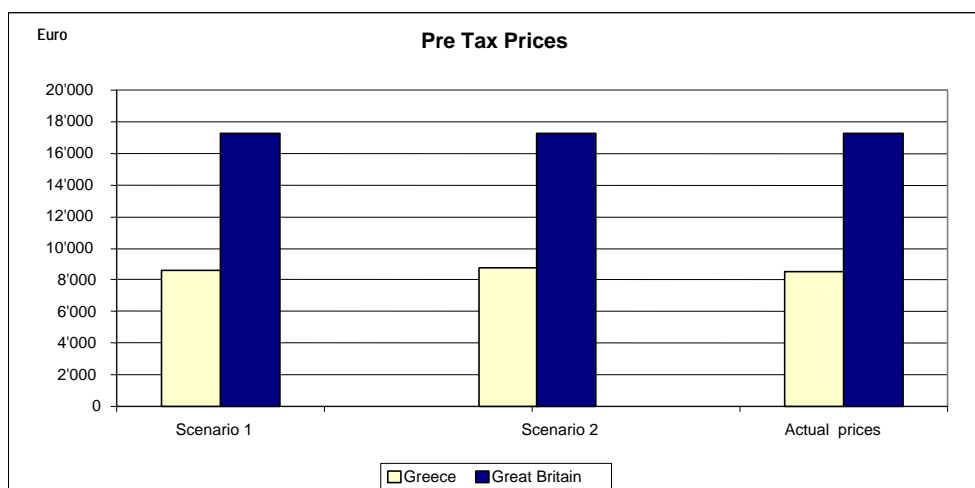
Scenario 2	Registration Tax		Circulation Tax		Fuel Tax	
	Variant 1	Variant 2	Variant 1	Variant 2	Variant 1	Variant 2
DK	206%	194%	946%	654%		0.4%
FIN	111%	88%	1020%	609%		0.2%
EL	33%	7%	602%	339%		1.4%
IRL	-24%	-50%	96%	51%		0.4%
NL	40%	24%	144%	111%		0.1%
A	-38%	-52%	31%	12%		0.1%
D						
IT	-43%	-61%	-12%	-16%		0.0%
UK						

As the tax changes already indicate, most significant are the changes in the high tax countries, since the demand effects offset partly the decrease of taxes. In Denmark for example, total tax income increases significantly which shows that the compensatory tax increases (by circulation tax) can be lower.

It has to be considered as well that the total effects arise in a new equilibrium state, after several years of adjustment, since car stock is reacting slower than the car market for new cars.

The following figure shows an illustrative comparison of the pre tax prices in the three scenarios. Greece has been chosen as the country with the lowest and Great Britain as the country with highest pre tax prices. As can be seen the scenarios have just a little influence on the gap of pre tax prices between countries.

Figure 39 - Pre Tax Price Differences between Greece and Great Britain



4.3.4. CTL (Circulation Tax over Vehicle Lifetime) Sensitivity Analysis

The basic idea of the model is to calculate the consequences of a reduction of the RT and a compensation of the losses in fiscal revenues over an increase of the CT for new sold cars. In the model one of the relevant inputs is the CT paid for a new car over its lifetime. For the calculation of this information the average imatriculation time of the vehicles for each country is relevant. As these figures do not exist, two proxies can be chosen:

- Average age of total car fleet, which is an underestimation of the imatriculation time
- Average lifetime of cars, which is an overestimation of the average imatriculation time. This is because usually cars aren't imatriculated during their whole life.

In the model we calculated with average age of total car fleet as detailed and reliable information on average lifetime of a car for each country considered was not available. The average age of the car fleets over all 9 countries in 1996 was assessed as 7.9 years,

For this reason, and in order to show the sensibility of the results depending on the choice of this proxy for average time of imatriculation, a sensitivity analysis was made approaching the second proxy mentioned, the average lifetime for passenger vehicles. For this purpose we assessed it by applying a factor of 1.5 over the 7.9 years previously mentioned. This results in nearly 12 years for lifecycle period, which is more likely to be closer to the real lifecycle period. Although this can not be considered as a definitive figure, is nonetheless providing a significant range for carrying out a sensitivity analysis, trying to understand what is the influence of such parameter in the results obtained so far. This factor was therefore applied to the national figures of average age of car fleet in the model.

Results

- The sensitivity analysis did not show important differences between these two variants for lifecycle parameter. The results are therefore robust while interpretations made are in general still valid.
- When looking at the changes of CTL, the amount of CT over lifecycle rises significantly because now the CT is collected over nearly 12 years instead of 7.9 years before.
- The relative results presented in figure 34 are still valid as well. The share of CTL on pre tax prices rises maximally about 40%, corresponding with the increase in considered lifetime.
- Demand for new cars in the countries is affected as expected in the sensitivity analysis. Looking at the average pre tax prices (table 55), almost no changes were observed. In all scenarios and all variants the maximal rise of average pre tax prices for a car is only 0.2%.

- Looking at the retail car price, the changes in Scenario 2 as shown in table 56 are almost not affected. In Greece for instance pre tax prices would rise 0.8 percentage points. In mean the changes are less then 0.3 percentage points and all algebraic signs do not change.
- Looking at the car age (table 57) the values of the actual base is 47% higher within the sensitivity analysis and the age in the different scenarios is significantly higher. But the changes of the average age in the two scenarios (and variants) in comparison to the corresponding situation in this analysis are rather similar to those in base scenario.

4.3.5 Impact on market distortions and social costs

The impact on the structure and the level of the parallel market cannot be measured properly for the three scenarios. But the price and demand changes modelled are important indicators for qualitative statements:

- The amount of parallel market sales will decrease according to the decrease of price differentials. As a rule of thumb we can state that the adjustment of tax differentials by 20% (according to the first scenario) will lead to a reduction of price differentials by 2-5%. Thus the additional cost occurring within the parallel market and other distorting effects might decrease by about this amount. Thus scenario 2 will have the highest impact on the reduction of the parallel market and will reduce related additional transaction costs by the highest rate. As a rough estimation, a reduction of about 5 to 10% of transaction costs can be expected at the maximum.
- Transparency for car buyers will increase, since the reduced car price differentials lead to more harmonised car price tables. Since today's transparency in total is rather high as stated in the previous chapters, we expect only a slight improvement in all scenarios.
- All scenarios will reduce the so-called double taxation problem, if registration taxes are adjusted. This effect is not really quantifiable and could not be modelled.
- Tax avoidance will change. We have to consider two effects. On one hand the rate of avoidance might be reduced by the reduction of the registration tax. Most obviously will people who move from one country to another register their car a bit earlier. We expect that this effect is rather small. Much more important is the second effect. The budget neutral shift from registration tax to circulation tax might induce some degree of circulation tax avoidance. Should such effect be significant, than it might bring along less than expected tax revenues. We have however seen in the previous section that the equilibrium adjustments of the circulation tax might be less dramatic, since a reduction of the registration tax is always increasing car demand, bringing along increased fiscal income on circulation tax, accrued from the overall vehicle fleet.
- The fuel tax changes shown above due to budget neutral tax shifts will lead to lower fuel consumption. The effects might be considerable in scenario 3, where Denmark and Greece face significant changes. Using an average fuel price elasticity of -0.3 (according to previous research studies results), the effects are in average rather minor. In maximum (for example Greece), the fuel consumption might be reduced by about 2-3% in maximum in those countries.⁴⁶ The fuel price changes might lead as well to increased fuel tourism.
- Looking at possible environmental effects, some reverse effects have to be considered:
 - *The increase in car demand in all scenarios will lead to an increased fuel consumption and related emissions*
 - *The increased fuel price might offset parts of it and will increase incentives to buy fuel efficient cars;*
 - *The reduced car age leads to more environmentally friendly cars considering the fact that new cars are more environmentally efficient than old ones. It is very difficult to say anything about the net result of these effects. We expect a slight deterioration due to demand effects, especially in Denmark and Finland.*

⁴⁶

Assuming in average, that fuel tax is about half of the fuel market price.

4.4. Interpretation of the results

The scenario approach allowed assessing the expected effects resulting from shifts between vehicle related taxation sources. The main findings may then be summarised as follows:

- Due to the fact that the registration tax does influence pre-tax and retail prices much more than all other vehicle taxes, a reduction or approximation of the registration tax is a key element for tax harmonisation in the EU;
- A reduced registration tax will increase pre-tax prices (producers rent) and decrease retail prices. The decrease leads to additional car sales (and increased registration tax income) and higher car ownership (bringing an increased annual circulation tax income).
- All three scenarios considered have shown that the first and by far the most important effect might be a significant loss of tax revenue accrued from registration tax. Therefore, to envisage a budget neutral way of tax adjustment, quite significant amounts of money will have to be redistributed between the three most important taxes (registration taxes, circulation taxes and possibly fuel taxes). These changes will have as well an impact on the related financing schemes and related adaptation processes.
- The impact on revenues is (by definition, due to the principle of budget neutrality) a minor effect if a compensating tax shift is considered. The model simulations for all three scenarios show that the reduction of the registration tax and the increase of the annual circulation tax is appropriate from a fiscal point of view, due to the fact that the latter is much less demand elastic. A change has however to consider the budget dynamics, since the reduction of registration tax is influencing car demand very quickly, whereas the change of car ownership and the increase of annual circulation tax is going on for some years. In general one has to consider nearly 8 years (average age of a car).
- An adjustment of the tax levels is mainly affecting the high taxation countries (esp. Denmark and Finland). The market changes are significant (i.e. change of price, change of demand), but not that dramatic, as long as budget neutral approaches are envisaged.
- An adjustment of the registration and the annual circulation tax levels to a range similar to that existing for VAT rates (9%) leads to quite significant tax changes which are comparable to the changes of a 50% cut of the registration tax, especially for Denmark and Finland. However, the resulting fuel price changes in order to keep tax income more or less stable would have to be huge.
- All scenarios will reduce distorting effects of the car market, but none of the scenarios will reduce additional transaction costs of parallel markets or lack of transparency for consumers to zero, since price differentials will be reduced but will remain at a slightly lower level due to normal market mechanisms (different demand levels, different income, different logistic costs etc.).
- In order to evaluate the scenarios, it is important to compare the positive and the negative effects at the same time. The positive effect is the reduction of market distortions, due to a price adjustment of the registration tax. The negative effects are the transaction costs for structural changes in high tax countries and the possible adverse environmental effects. Every scenario faces this trade off, but on different levels.

5. CONCLUSIONS AND RECOMMENDATIONS

The main conclusions of this study are as follows:

- There are indeed big differences in vehicle taxation in the countries analysed. But these differences are not the expression of some form of tax competition, but rather of historically different approaches to vehicle taxation;
- There is a high inertia of such taxing approaches given the heavy weight of this source of revenue for the State, representing from 4.5% to 10.2% of the total tax revenue, if we consider together the main forms of vehicle related taxation: registration taxes, annual circulation taxes and fuel taxes. Therefore, vehicle fiscal policy is expected to have a non-negligible and direct effect on most families in the population as well as, in some countries, significant industrial organisations.
- As a confirmation that we are not dealing with forms of tax competition (to increase sales, or to gain some form of national advantage), we have not observed any significant shift of these taxing approaches since the introduction of the European Single Market.
- As regards the functioning of the internal market, the main problem is the lack of comprehensive and easily accessible information on the often rather complex procedure for a person doing it for the first time. No further barriers have been identified either with regard to parallel imports from one country to another, or to a citizen migrating from one country to another taking his car along and registering it in the new country of residence. Direct costs (fees paid and time costs) are low.
- The relative ease of importing procedures and the added transparency of the adoption of the EURO by 12 countries, some of them with high taxation levels and thus with low base prices for the cars, makes it likely that parallel imports may grow, thus establishing market counter-arbitrage by foreign consumers taking advantage of adaptation moves by the car industry in high taxation countries.
- Tax avoidance is very poorly documented, and numerical values were found only for one country. In any case, no link between this problem and taxation differences was found;
- Scrappage schemes do not seem to have a strong influence on vehicle age, at least in the form they have been practised, in which purchase of a new car is imposed. This may be due to the fact that relatively few people who keep a car until an age of 12 or more years will have the money available to buy a new one. No link could be detected between abandoned cars and taxation levels in a given country;
- Some statistical evidence has been found relating demand-side variables with taxation levels. The following table summarises these findings:

A change of the ...		leads to a change of the...	
• Registration Tax	-10%	⇒ pre-tax price	+1.1%
(expressed as RT in relation to pre tax price)			
• Annual Circulation Tax/base price	+10%	⇒ pre-tax price	-0.1%
(expressed as CT in relation to pre tax price)			
• Retail price	-10%	⇒ demand cars per capita	+1.1%
• Income rise	+10%	⇒ demand cars per capita	+4.1%
• Increase of ACT and RT	+10%	⇒ car age	+ 0.28 years
(expressed as life cycle costs)			

- From this table we can see that the level of Registration Tax is influencing car prices significantly more than the levels of Annual Circulation Tax. Sales volumes are affected by the final retail prices but much more strongly by purchasing power;
- Three scenarios have been defined for reduction of differences in vehicle Registration Tax, all under a constraint of budget neutrality (which is easy to understand given the already mentioned weight of these taxes on the overall fiscal revenue of the State). Budget neutrality was achieved by raising both Annual Circulation and Fuel taxes, according to the situations variants of each scenario. The orders of magnitude of the impacts of those changes are different but the conclusions are identical:
- In all scenarios the changes needed on the Annual Circulation Tax and/or on the fuel tax seem to be within manageable dimensions, except for the attempt of an approximation to a limited range of 9%;
- A reduced registration tax will increase pre-tax prices (producers rent) and decrease retail prices. The decrease leads to additional car sales (and increased registration tax income) and higher car ownership (bringing an increased annual circulation tax income);
- All scenarios will reduce distorting effects of the car market, but none of the scenarios will reduce additional transaction costs of parallel markets or intransparency for consumers to zero, since price differentials will be reduced but only slightly, due to normal market mechanisms (different demand levels, different income, different logistic costs etc.);
- Such changes however must consider budget dynamics, since reduction of the registration tax is influencing car demand very quickly, whereas the change of car ownership and the increase of annual circulation tax is going on for some years. In general one has to consider 8 years (average age of a car);
- In any case, a transition period should be established in order to avoid an excessive fiscal burden on someone who bought a new car with high registration tax just before the change of the overall vehicle taxation scheme. Given the typical duration of political cycles, a transition of 4 to 5 years would probably be adequate;
- The amount of parallel market sales will decrease according to the decrease of price differentials. As a rule of thumb, we can state that the adjustment of tax differentials by 20% (according to the first scenario) will lead to a reduction of price differentials by 2-5%.
- Tax avoidance may change. A shift from registration tax to circulation tax might increase incentives to avoid the payment of circulation tax, unless an effective information system is implemented, envisaging its enforcement. We have however seen that the equilibrium adjustments of the circulation tax might be less dramatic, since a reduction of the registration tax is always increasing demand and thus as well the income on circulation tax.
- When budget neutrality is achieved with recourse to fuel tax changes, fuel consumption will be lower. Using an average fuel price elasticity of -0.3 (according to research results), the effects are in average rather minor. It is estimated, however, that in the worst cases fuel consumption might be reduced by about 2-3% in maximum in those countries.
- The issue of an optimal tax structure must be raised. The registration tax has the advantage of being a steering element for the purchase of new cars. This element can be used for environmental reasons, for example by differentiating the tax according to environmental criteria. Compared to that, the annual circulation tax has the advantage of being a more stable source of revenue (less sensitive to economic cycles), and could also in principle be connected to some environmental aggression index of the car, but this would likely have a lower influence in purchasing options;
- When evaluating these changes, it is important to compare the positive and the negative effects at the same time. The positive effect is the reduction of market distortions, due to a price adjustment of the registration tax. The negative effects are mainly the (political and administrative) transaction costs for structural changes in high tax countries. Each of the three tested scenarios faces this trade off, but at different levels;

Our concluding opinion on this matter is that many citizens would see this approximation as positive, although this is not a first order item on their agenda. On the other hand, several national governments will probably resist this change (even if budget neutrality can be achieved without great difficulty) because of their wish to keep on addressing those secondary policy goals that justify the current taxation level. This would imply that any acceptance of that approximation would have to be accompanied by a transition period, during which those governments would try to develop alternative strategies for addressing those secondary goals of their fiscal policy.

As a result of these conclusions and interpretations, **the main recommendations are:**

- *Although no market distortions are clearly recognised in this domain, a progressive reduction of the differences would have a positive effect for the image of the Internal Market. Therefore future action should be taken progressively and in steps, taking into account the specific situation of each particular Member State.*
- *This progressive reduction of differences (by transfer of revenue from RT to ACT) may well be stimulated by recognition that greater fiscal stability would be achieved, as by the increase of parallel imports as a result of direct price comparability in Euro. Suspicion of citizens about the reasons for such price differences may prove a strong factor towards approximation;*
- *Given the acceptance concerns underlying taxation issues, it should be clearly defined both a transition period and an feasible implementation process, when envisaging a change in the vehicle taxation policy, taking in account the specificities of each country.*

□

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ANNEX - Additional information to model and scenario simulation

1. Data basis

For the econometric analysis we needed data (for the years 1999 and 2000) for car prices for all 9 countries, figures about the related sales numbers and a set of different other economic and socio-economic variables for each of the countries considered.

Information on car prices and sales: After evaluating different possible data sources only the data from JATO showed the necessary quality and all the requested information. JATO is the leading supplier of automotive market intelligence, delivering comprehensive, accurate and current databases of vehicle specifications, sales, registrations, forecast, incentives and pricing.

The data base from JATO showed for the 20 top selling models for each country the needed information. The 20 top selling models for each country differ from country to country. In order to have a comparable data base between the 9 countries for every country the needed information had to be available for all cars, which are within the 20 top selling models in any of the 9 countries. The data sheet presents the following extract out of the data for Austria. Overall we have a data set for 37 car models in all 9 countries.

Make and Model	Version	Engine litres	fuel type	currency	average price	models sold	turnover
ALFA ROMEO 156	1.6 T.SPARK 16V	1.6	petrol	Austrian Schilling	284'000	22	454060
ALFA ROMEO 156	1.6 T.SPARK 16V	1.6	petrol	Austrian Schilling	289'000	155	3255380
ALFA ROMEO 156	1.8 T.SPARK 16V S	1.7	petrol	Austrian Schilling	370'500	10	269253
ALFA ROMEO 156	1.8 T.SPARK 16V S	1.7	petrol	Austrian Schilling	303'000	17	374338
ALFA ROMEO 156	1.8 T.SPARK 16V S	1.7	petrol	Austrian Schilling	309'000	103	2312958
ALFA ROMEO 156	1.9 JTD	1.9	diesel	Austrian Schilling	295'000	69	1479256
ALFA ROMEO 156	1.9 JTD	1.9	diesel	Austrian Schilling	301'000	508	11112258
ALFA ROMEO 156	2.0 T.SPARK 16V	2.0	petrol	Austrian Schilling	328'000	31	738937
ALFA ROMEO 156	2.0 T.SPARK 16V	2.0	petrol	Austrian Schilling	351'500	258	6590481
ALFA ROMEO 156	2.4 JTD	2.4	diesel	Austrian Schilling	335'000	50	1217270
ALFA ROMEO 156	2.4 JTD	2.4	diesel	Austrian Schilling	341'000	411	10185170
ALFA ROMEO 156	2.5 V6 24V	2.5	petrol	Austrian Schilling	416'000	3	90696
ALFA ROMEO 156	2.5 V6 24V	2.5	petrol	Austrian Schilling	437'000	67	2127788

Example for the available information from the JATO data base

For every car model the prices are differentiated between different versions (about 30 versions per car model). In basic version the data set contained therefore over 10'000 data points.

In a first step we aggregated the information for the different versions and calculated one price for one car model in one country (e.g. for Alfa Romeo 156 in Austria), using a weighted average. The prices from JATO are pre tax prices. For our purposes additionally the specific registration tax, the circulation tax (per year and per lifecycle) and the retail price for every model was needed. The next step was therefore to calculate these missing information for every of the 335 models. The following working step was to check the data quality e.g. by comparing them with the data base for car prices from DG competition. After this step the data base for the econometric analysis was completed. After reassuring several aspects with JATO for every car model in each country we declared the data base as correctly adjusted and ready for using.

Additional variables: The needed additional information for all countries (e.g. population, cars in use, GDP, generally wide range of possible explanatory variables) was collected from different statistical sources or personal interviews. We needed a large number of additional variables a) for the econometric analysis in order to find good equations for explaining car price differentials and car demand and b) for the scenario analyses. The following table only shows a small part of all the variables needed or tested.

Country	GDP Growth 98-99	GDP (1999)	average inflation 1996-2000	Population 2000	Sold new cars 1999	Average new cars sold 1994-1999	Car in use 1998	average car age
Austria	0.018	195397000000	0.007	8103000	314182	293923	3887000	7.30
Denmark	0.026	163514000000	0.013	5330000	143727	147304	1822000	8.50
Finland	0.026	121703000000	0.009	5171000	136324	101763	2008000	10.10
Germany	0.016	1982381000000	0.007	82164000	3802176	3505700	41674000	6.80
Great Britain	0.037	1352753000000	0.009	59623000	2197615	2054274	26269000	7.20
Greece	0.040	117401000000	0.025	10546000	261711	185628	2568000	8.70
Ireland	0.067	87677000000	0.016	3777000	174242	141893	1197000	7.60
Italy	0.016	1099105000000	0.013	57864000	2352218	2011992	31371000	7.80
Netherlands	0.028	369530000000	0.011	15864000	611488	522746	6120000	7.30

Country	Purchasing Power Parity (1999)	short term interest rates (1998)	Insurance and tolls revenues 1995	tax revenues RT 1995	tax revenues CT 1995	Road length (km) 1994	mio. Km per Year
Austria	109	3.40	1226000000	224000000	345000000	106267	57530
Denmark	120	4.10	189000000	2083000000	609000000	71111	32896
Finland	101	3.30	114000000	465000000	294000000	98723	38910
Germany	106	3.40	3963000000	0	7205000000	641600	545650
Great Britain	101	7.20	340000000	0	6462000000	364966	392200
Greece	67	12.60	0	462000000	738000000	117000	9932
Ireland	113	5.80	0	396000000	338000000	92446	27542
Italy	102	5.20	2769000000	462000000	738000000	312320	390210
Netherlands	115	3.20	0	1874000000	2357000000	103800	101490

Extract of the factsheet with additional information about the 9 countries used for the scenario analyses.

2. Estimation approach

For both equations – price and demand – the functional form of the estimation approach is a linear OLS regression. The econometric analysis was made with the SPSS software. In all the modelling work the relevant statistical parameters and tests were carried out e.g.:

- T-statistics: We took a 95% confidence level for all equations (t-value 1.645), but for almost all variables used the confidence interval is 99% (t-value 2.326) or more.
- Durbin-Watson: The Durbin-Watson tests for serial correlation of the residuals and case wise diagnostics for the cases meeting the selection criterion (outliers above standard deviations). Tests the auto-correlation of the residuals, a value closer to 2 means small auto-correlation.
- Collinearity statistics: Collinearity (or multicollinearity) is the undesirable situation where the correlations among the independent variables are strong; Auto-values of the scaled and uncentered cross-products matrix, condition indices, and variance-decomposition proportions are displayed along with variance inflation factors (VIF) and tolerances for individual variables. It is a statistic used to determine how much the independent variables are linearly related to one another (multicollinear). The proportion of a variable's variance is not accounted for by other independent variables in the equation. A variable with very low tolerance contributes little information to a model, and can cause computational problems. It is calculated as 1 minus R squared for an independent variable when it is predicted by the other independent variables already included in the analysis. The closer the tolerance value to 0 the bigger the problem with collinearity. Considering the condition index, a figure higher than 15 would signal problems with collinearity.

3. Test results and selected plots

The proceeding for the econometric analysis was – listed in a simplified manner- as follows:

- Establishing hypothesis for price and demand equation

- Decision whether to estimate price levels or price differentials
- Choice of a reference point for price differentials (one, country, average of medium tax countries or average over all countries)
- Postulating equation of interest
- Testing the hypotheses
- Search for reasons for unexpected results (refuse of hypothesis, wrong specification of variables, collinearity problems etc.)
- Adjustments in the equation
- Test of the statistical parameters

3.1 Price equation

The hypothesis is that the pre tax price is negatively correlated with the level of car taxes (registration tax, circulation tax, fuel tax) in a country. This means that producers and dealers try to smooth retail prices (after tax prices) in order to reduce the price differences between countries.

The different attempts of model specification show, that it is reasonable to take the percentage deviation from a car model price in one country in relation to the average price of this car model of all countries as dependent variable. Besides the GDP per head and the tax levels no other variable was assumed to have a significant impact. When taking the registration tax, the circulation tax and the value added tax as independent variables it showed up, that VAT has no significant influence.

The influence of GDP per capita is strongly positive and the dominant factor. This shows that the producers and dealers follow a clear strategy of price differentiation according to the willingness to pay in each country. The tax levels have a negative influence on pre tax prices as supposed. The influence of the level of the registration tax is about ten times higher than the influence of the circulation tax over lifetime.

As supposed in the hypothesis pre tax prices for the same cars tend to be lower in high tax countries. We expect that car producers embark on a European price strategy. But cross price elasticity's are not covered in the equation.

The equation is calculated in percentage deviation from the average of all nine countries and not in logarithm, because we have negative and positive values on both hands of the equation.

The following tables and figures give an overview of the final price equation. The Adjusted R₂ of 0.66 shows that we found a quite good equation. All the statistical test are satisfying:

$$\left(\frac{BP}{BP_a} - 1 \right) = a1 + a2 \left(\frac{\frac{CT}{BP}}{\frac{CT_a}{BP_a}} \right) + a3 \left(\frac{\frac{RT}{BP}}{\frac{RT_a}{BP_a}} \right) + a4 \left(\frac{GDPpC}{GDPpC_a} \right)$$

BP:	Base price = pre tax price of a specific car model.
_a:	Variable on average of the 9 countries for a specific car model.
CT:	Circulation tax for a specific car model over the life cycle.
RT:	Registration tax for a specific car model.
GDPpC:	GDP per Capita in a country.

Descriptive Statistics

	Mean	Std. Deviation	N
P_BPLEFT	.0000	.20848	335
I2D_CTA	1.2305	1.76744	335
I2_D_RT	1.2245	1.54602	335
BIPPOP_M	.0281	.20411	335

P_BPLEFT: Not used in the following
 I2D_CTA: Circulation tax for a specific car model over the life cycle in relation to the average circulation tax for a specific car model of all nine countries, specified as shown above.
 I2_d_RT: Registration tax for a specific car model in relation to the average registration tax for a specific car model of all nine countries, specified as shown above.
 BIPPOP_M: GDP per capita in Euro of one country in relation to the average of all nine countries, specified as shown above

Correlations

		P_BPLEFT	I2D_CTA	I2_D_RT	BIPPOP_M
Pearson Correlation	P_BPLEFT	1.000	-.249	-.681	.181
	I2D_CTA	-.249	1.000	.328	.238
	I2_D_RT	-.681	.328	1.000	.329
	BIPPOP_M	.181	.238	.329	1.000
Sig. (1-tailed)	P_BPLEFT	.	.000	.000	.000
	I2D_CTA	.000	.	.000	.000
	I2_D_RT	.000	.000	.	.000
	BIPPOP_M	.000	.000	.000	.
N	P_BPLEFT	335	335	335	335
	I2D_CTA	335	335	335	335
	I2_D_RT	335	335	335	335
	BIPPOP_M	335	335	335	335

Variables Entered/Removed^b

Model	Variables Entered	Variables Removed	Method
1	BIPPOP_M, I2D_CTA ^a , I2_D_RT	.	Enter

a. All requested variables entered.
 b. Dependent Variable: P_BPLEFT

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.810 ^a	.656	.653	.12283	.750

a. Predictors: (Constant), BIPPOP_M, I2D_CTA, I2_D_RT
 b. Dependent Variable: P_BPLEFT

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	9.522	3	3.174	210.369	.000 ^a
	Residual	4.994	331	.015		
	Total	14.516	334			

a. Predictors: (Constant), BIPPOP_M, I2D_CTA, I2_D_RT

b. Dependent Variable: P_BPLEFT

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	% Confidence Interval for		Correlations			Collinearity Statistics		
		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF	
1	(Constant)	.133	.009		14.470	.000	.115	.151						
	I2D_CTA	.14E-02	.004	-.097	-2.814	.005	-.019	-.003	-.249	-.153	-.091	.873	1.145	
	I2_D_RT	-.108	.005	-.803	-22.641	.000	-.118	-.099	-.681	-.780	-.730	.826	1.211	
	BIPPOP_M	.479	.035	.469	13.588	.000	.410	.548	.181	.598	.438	.873	1.146	

a. Dependent Variable: P_BPLEFT

Coefficient Correlations^a

Model			BIPPOP_M	I2D_CTA	I2_D_RT
1	Correlations	BIPPOP_M	1.000	-.146	-.274
		I2D_CTA	-.146	1.000	-.272
		I2_D_RT	-.274	-.272	1.000
	Covariances	BIPPOP_M	1.243E-03	-2.10E-05	-4.62E-05
		I2D_CTA	-2.099E-05	1.656E-05	-5.29E-06
		I2_D_RT	-4.615E-05	-5.29E-06	2.289E-05

a. Dependent Variable: P_BPLEFT

Collinearity Diagnostics^a

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions			
				(Constant)	I2D_CTA	I2_D_RT	BIPPOP_M
1	1	2.316	1.000	.07	.07	.07	.04
	2	.897	1.607	.09	.01	.00	.80
	3	.447	2.275	.11	.89	.26	.00
	4	.340	2.611	.74	.03	.67	.16

a. Dependent Variable: P_BPLEFT

Casewise Diagnostics^a

Case Number	Std. Residual	P_BPLEFT	Predicted Value	Residual
150	3.056	.07	-.3044	.3754
189	3.098	.52	.1409	.3806
214	3.595	.58	.1399	.4416

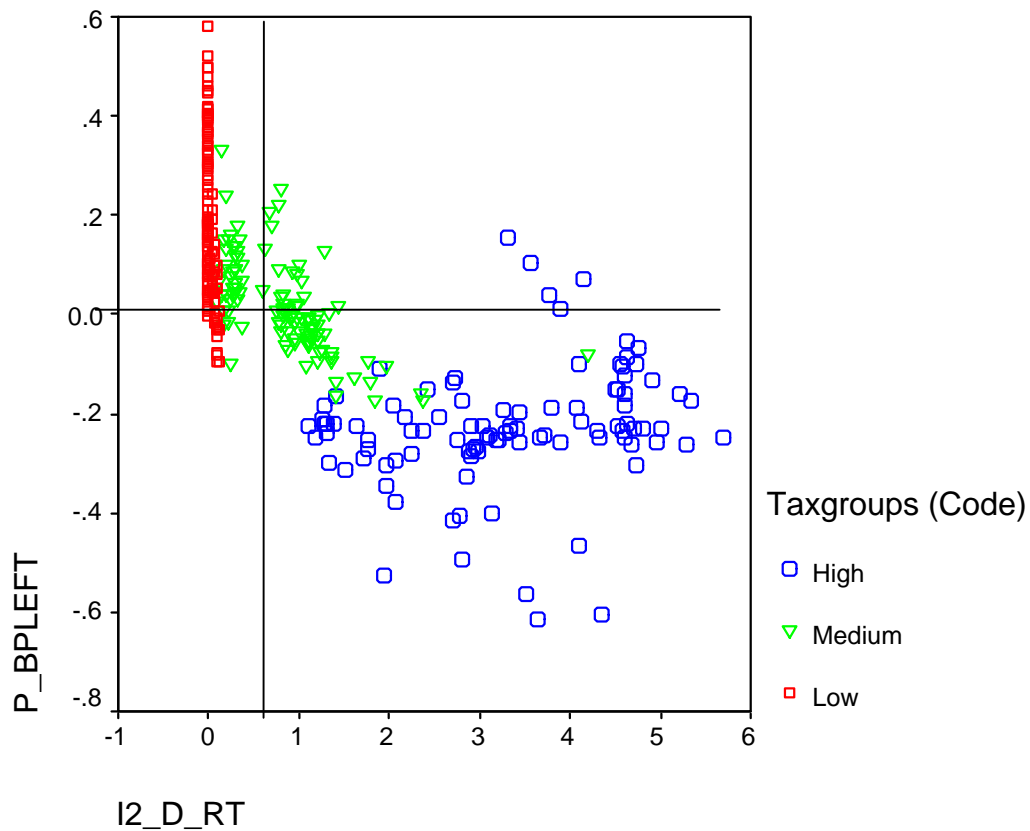
a. Dependent Variable: P_BPLEFT

Residuals Statistics^a

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	-.5917	.1742	.0000	.16885	335
Residual	-.2738	.4416	.0000	.12228	335
Std. Predicted Value	-3.505	1.032	.000	1.000	335
Std. Residual	-2.229	3.595	.000	.995	335

a. Dependent Variable: P_BPLEFT

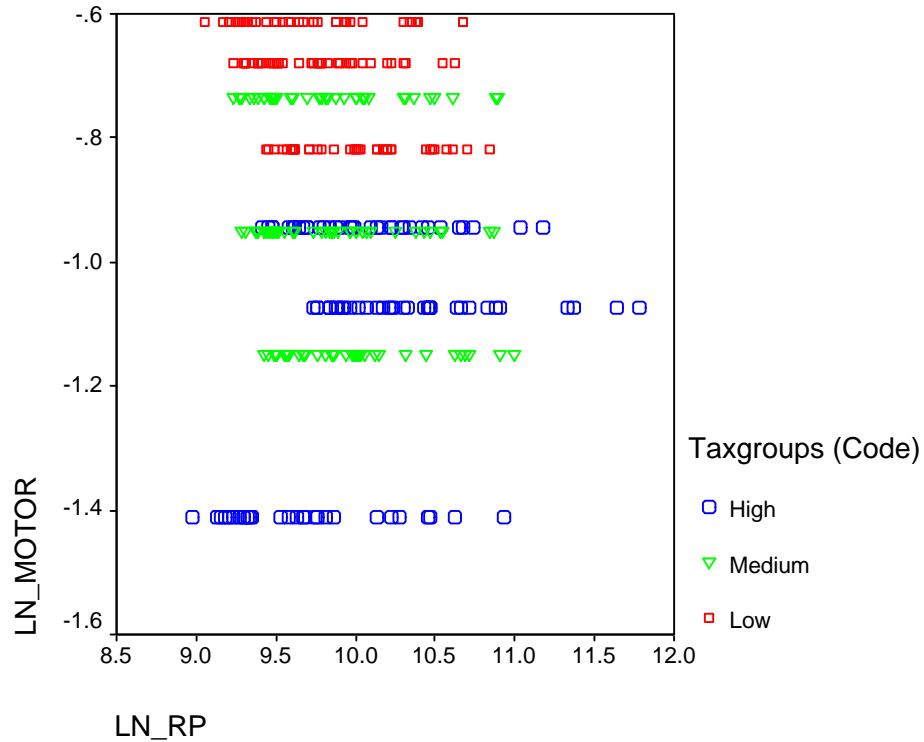
The following figure shows the difference of pre tax prices per car models from the average of the car model in the nine countries on the y-axis and the difference in the share of the registration tax on the pre tax price in relation to the average share of registration tax on pre tax price. The plot shows the negative connection between registration tax and pre tax price differential. On the x-axis the point no deviation from the average is at value 1.



3.2 Demand equation

We first wanted to model the demand for new cars. But we couldn't find any equation with at least some small evidence. Even if we took only the high and the low tax countries in the sample or made other restrictions that should strengthen the hypothesis, no evidence of influence between GDP, retail price and demand for new car was found. One important reason for this is, that in a time series analysis it would have been no problem to separate a significant income and a price effect; but we had to do the regression in a cross section analysis and obviously the 9 countries were too similar with regard to GDP per capita. The 9 countries are all well developed and quite rich so that no income effect showed up in the data. After several runnings we therefore gave up trying to explain demand for new cars but changed to motorization as dependent variable.

The hypothesis is that motorization is positively dependent from GDP per head and negatively from the retail price of the cars. We finally find an equation with significant coefficients. The coefficients show really plausible magnitudes, but the fit of the equation overall remains quite bad. The following figure shows the reason why:



The final equation is estimated in natural logarithm, so the coefficients may be interpreted as elasticity's. In comparison with results from the wide range of studies that have already dealt with this kind of questions, the results we found are very reasonable and useful for the planned scenario analysis. In the end the final demand equation is very simple. The motorization is positively dependent of GDP and negatively of the retail price. The influence of GDP is the dominant factor.

The following tables and figures give an overview of the final demand equation. The Adjusted R₂ of 0.18 shows that the equation is quite bad because of the mentioned reasons. Most statistical test are satisfying apart from the Durbin Watson test:

Descriptive Statistics

	Mean	Std. Deviation	N
LN_MOTOR	-.9110	.22860	337
LN_RP	9.9074	.48398	337
LN_BIBPO	10.0100	.23767	337

- LN_MOTOR Natural logarithm of motorization (cars per 1000 inhabitants).
- LN_RP Natural Logarithm of the retail price
- LN_BIPPO Natural Logarithm of GDP per capita

Correlations

		LN_MOTOR	LN_RP	LN_BIBPO
Pearson Correlation	LN_MOTOR	1.000	-.114	.370
	LN_RP	-.114	1.000	.267
	LN_BIBPO	.370	.267	1.000
Sig. (1-tailed)	LN_MOTOR	.	.018	.000
	LN_RP	.018	.	.000
	LN_BIBPO	.000	.000	.
N	LN_MOTOR	337	337	337
	LN_RP	337	337	337
	LN_BIBPO	337	337	337

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.431 ^a	.186	.181	.20693	.186	38.037	2	334	.000	.065

a. Predictors: (Constant), LN_BIBPO, LN_RP

b. Dependent Variable: LN_MOTOR

ANOVA^b

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.258	2	1.629	38.037	.000 ^a
	Residual	14.302	334	.043		
	Total	17.559	336			

a. Predictors: (Constant), LN_BIBPO, LN_RP

b. Dependent Variable: LN_MOTOR

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B		Correlations			Collinearity Statistics		
		B	Std. Error				Beta	Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	-3.987	.488		-8.173	.000	-4.946	-3.027						
	LN_RP	-.108	.024	-.229	-4.473	.000	-.156	-.061	-.114	-.238	-.221	.929	1.076	
	LN_BIBPO	.414	.049	.431	8.409	.000	.317	.511	.370	.418	.415	.929	1.076	

a. Dependent Variable: LN_MOTOR

Coefficient Correlations^a

Model		LN_BIBPO	LN_RP
1	Correlations	LN_BIBPO	1.000
		LN_RP	-.267
	Covariances	LN_BIBPO	2.429E-03
		LN_RP	-3.179E-04

a. Dependent Variable: LN_MOTOR

Collinearity Diagnostics^a

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
				(Constant)	LN_RP	LN_BIBPO
1	1	2.998	1.000	.00	.00	.00
	2	1.472E-03	45.135	.06	1.00	.06
	3	2.807E-04	103.347	.94	.00	.94

a. Dependent Variable: LN_MOTOR

Residuals Statistics^a

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	-1.3079	-.7579	-.9110	.09846	337
Residual	-.3168	.4460	.0000	.20631	337
Std. Predicted Value	-4.031	1.555	.000	1.000	337
Std. Residual	-1.531	2.155	.000	.997	337

a. Dependent Variable: LN_MOTOR

Our aim was to be able to calculate different scenarios of changes in the tax structure and the connected implications on motorization. But motorization can change due to two major reasons: a) persistent change of the demand for new cars, b) change of average life time of the cars in use due to changes in the structure of car taxes. In order to separate these two important effects in the scenarios we additionally had to estimate an equation for the average car age per country.

The equation shows that average car age becomes smaller with higher GDP per capita and higher with higher car prices. The influence of the car prices is reflected in this equation by the cost over lifecycle of a car, defined as retail price plus circulation tax over lifetime. This variable fits best and this shows that for the decision whether to keep an old car the cost over lifecycle and with this the circulation tax gets more important. This has to be taken into account within the scenarios.

The following tables show the equation for the car age. The equation has a good fit with an adjusted R₂ of 0.83 and the entire statistical tests are satisfying:

Descriptive Statistics

	Mean	Std. Deviation	N
Average car age	7.6500	.65683	8
P_COLIC	.9843	.29615	8
P_BIBPOP	.9941	.24681	8

Average Car age: Dependent variable, Average car age per country in number of years.

P_COLIC: Cost over lifecycle; pre tax price plus registration tax plus VAT plus circulation tax over average lifetime.

P_BIPPOP: GDP per capita in a country in relation to the average GDP per capita of the nine countries

Correlations

		Average car age	P_COLIC	P_BIBPOP
Pearson Correlation	Average car age	1.000	.405	-.309
	P_COLIC	.405	1.000	.708
	P_BIBPOP	-.309	.708	1.000
Sig. (1-tailed)	Average car age	.	.160	.228
	P_COLIC	.160	.	.025
	P_BIBPOP	.228	.025	.
N	Average car age	8	8	8
	P_COLIC	8	8	8
	P_BIBPOP	8	8	8

Model Summary^b

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics					Durbin-Watson
					R Square Change	F Change	df1	df2	Sig. F Change	
1	.936 ^a	.877	.828	.27274	.877	17.800	2	5	.005	1.978

a. Predictors: (Constant), P_BIBPOP, P_COLIC

b. Dependent Variable: Average car age

ANOVA^b

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.648	2	1.324	17.800	.005 ^a
	Residual	.372	5	.074		
	Total	3.020	7			

a. Predictors: (Constant), P_BIBPOP, P_COLIC

b. Dependent Variable: Average car age

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95% Confidence Interval for B		Correlations			Collinearity Statistics		
		B	Std. Error				Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF	
1	(Constant)	8.080	.432		18.715	.000	6.970	9.190						
	P_COLIC	2.777	.493	1.252	5.632	.002	1.509	4.044	.405	.929	.884	.498	2.007	
	P_BIBPOP	-3.183	.592	-1.196	-5.379	.003	-4.704	-1.662	-.309	-.923	-.844	.498	2.007	

a. Dependent Variable: Average car age

Coefficient Correlations^a

Model			P_BIBPOP	P_COLIC
1	Correlations	P_BIBPOP	1.000	-.708
		P_COLIC	-.708	1.000
	Covariances	P_BIBPOP	.350	-.207
		P_COLIC	-.207	.243

a. Dependent Variable: Average car age

Collinearity Diagnostics^a

Model	Dimension	Eigenvalue	Condition Index	Variance Proportions		
				(Constant)	P_COLIC	P_BIBPOP
1	1	2.945	1.000	.01	.00	.00
	2	3.817E-02	8.784	.78	.36	.02
	3	1.665E-02	13.299	.21	.63	.98

a. Dependent Variable: Average car age

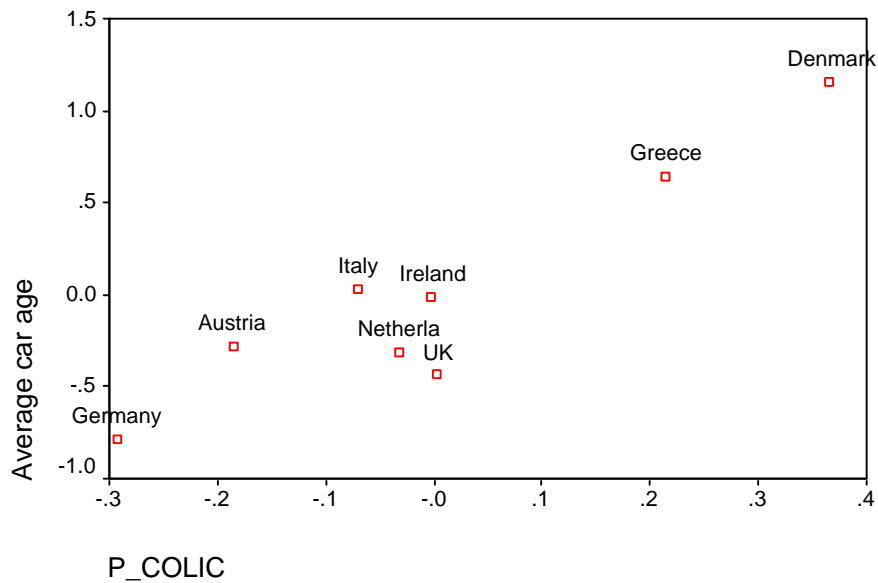
Residuals Statistics^a

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	6.7707	8.6564	7.6500	.61506	8
Residual	-.4439	.2292	.0000	.23051	8
Std. Predicted Value	-1.430	1.636	.000	1.000	8
Std. Residual	-1.628	.840	.000	.845	8

a. Dependent Variable: Average car age

Partial Regression Plot

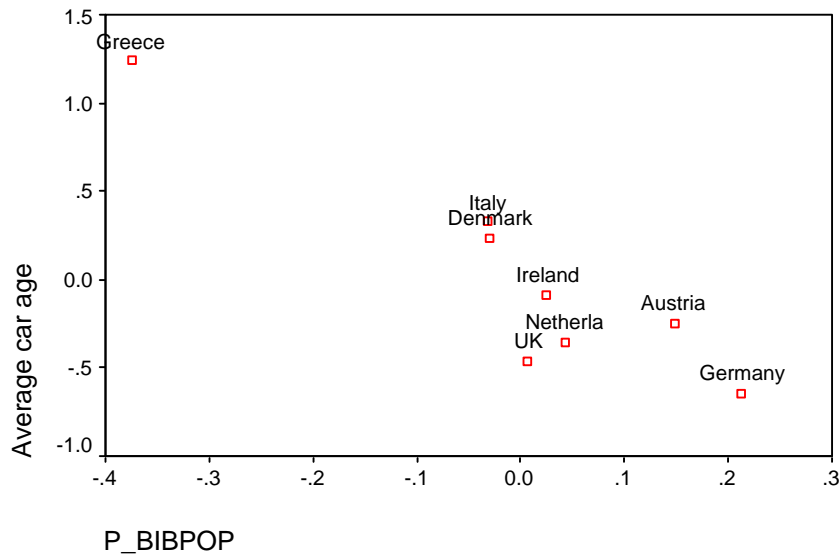
Dependent Variable: Average car age



The Figure above shows the cost over lifecycle on the x-axis and the average car age on the y-axis.

Partial Regression Plot

Dependent Variable: Average car age



The Figure above shows the GDP per capita on the x-axis and the average car age on the y-axis.

4. Scenario result files

4.1 Scenario 1 (RT-20%)

Scenario: Reduction of registration tax (RT) minus 20%.

Variant 1: Compensation over circulation tax (100% of losses in fiscal revenues on CT)

Variant 2: Compensation over circulation tax (CT) and fuel tax (FT) (50% of losses in fiscal revenues on CT, 50% in FT)

Assumptions:

- Car producers do not change car prices in other countries than the one which changes level of taxes (cross price elasticities = 0)
- No change in abandonment and arbitrage
- No short run influence of change in fuel tax on pre tax price and car demand.

The scenarios 1 and 2 are calculated in the following logic:

- a) Reduction of RT
- b) Losses in Fiscal revenues assuming a constant motorization
- c) Compensation of these losses through an increase in the CT
- d) Calculating the resulting pre tax price after changes in RT and CT
- e) Calculating the new retail price basing in the changed pre tax price.
- f) Change of motorization (demand) due to the change of the retail price
- g) Change of the fiscal revenues due to lower demand for new cars
- h) Change of the fiscal revenues due to a change in the average lifetime of the cars in use.
- i) Additional need to adjust CT in order to get the aimed at fiscal neutrality per country after the reaction in motorization.

For both scenarios all three equations (price, motorization, car age) are used. For applying the price equation we had to put on a simplification.⁴⁷ We multiplied the change in RT and CT with the corresponding coefficients from the price equation and ignored the denominator in the detailed formula.

⁴⁷ The price equation is calculated on a data base covering the information on the level of car models per country. For the scenario analysis it was not possible to make the simulations for every single car model and country, nor was it possible to fully apply the mathematical formula of the price equation. The denominator in the formula is changing every time one country changes.

The following table shows an overview of the results of scenario 1.

	Losses in revenues from RT	Increase of CT in %		Change of base price in %		Change of retail price in %		Change of cost over lifecycle in %			
	S20 (Mio.Euro)	S20-V1	S20-V2	S20-V1	S20-V2	S20-V1	S20-V2	S20-V1	S20-V2	S20-V1	S20-V2
Austria	62.5	14.2%	7.1%	2.0%	2.1%	-0.6%	-0.5%	0.4%	0.0%		
Denmark	375.9	47.9%	24.0%	1.6%	1.9%	-10.5%	-10.4%	-1.3%	-5.0%		
Finland	232.8	94.8%	47.4%	1.1%	1.6%	-8.6%	-8.3%	-1.0%	-4.2%		
Germany	0.0	0%	0%	0%	0%	0%	0%	0.0%	0.0%		
Great Britain	0.0	0%	0%	0%	0%	0%	0%	0.0%	0.0%		
Greece	194.2	90.1%	45.1%	1.1%	1.6%	-4.6%	-4.2%	0.8%	-1.4%		
Ireland	101.1	31.1%	15.5%	1.8%	2.0%	1.0%	1.1%	3.9%	2.5%		
Italy	98.5	3.5%	1.8%	2.1%	2.1%	0.3%	0.4%	0.6%	0.5%		
Netherlands	313.4	13.6%	6.8%	2.0%	2.1%	-9.8%	-9.8%	-5.8%	-6.9%		
Change demand for new cars overall (number)		Change in revenues RT (Mio. Euro)		Change in revenues CT (Mio. Euro)		Change in revenues FT (Mio. Euro)		Tot. change revenues (Mio. Euro)			
S20-V1 (vehic.)		S20-V2		S20-V1		S20-V2		S20-V1		S20-V2	
Austria	-1109	3986	-0.88	3.17	7.74	6.27	0.00	3.60	6.86	13.05	
Denmark	72798	107087	761.56	1120.27	488.39	404.60	0.00	16.38	1249.96	1541.25	
Finland	54178	72621	370.09	496.07	168.42	123.11	0.00	13.55	538.51	632.73	
Germany	0	0	0	0	0	0	0.00	0.00	0.00	0.00	
Great Britain	0	0	0	0	0	0	0.00	0.00	0.00	0.00	
Greece	47559	55364	141.16	164.33	81.20	56.84	0.00	12.91	222.36	234.09	
Ireland	-19113	-14374	-44.37	-33.37	-9.72	-9.86	0.00	9.56	-54.09	-33.67	
Italy	-67602	-59495	-11.32	-9.97	-25.94	-26.99	0.00	7.14	-37.27	-29.82	
Netherlands	306289	331623	627.86	679.79	719.77	672.44	0.00	19.48	1347.63	1371.71	

4.2 Scenario 2 (RT-50%)

- Scenario: Reduction of registration tax minus 50%.
 Variant 1: Compensation over circulation tax (100% of losses in fiscal revenues on CT)
 Variant 2: Compensation over circulation tax and fuel tax (50% of losses in fiscal revenues on CT, 50% in FT)
 Assumptions: - Car producers do not change car prices in other countries than the one which changes level of taxes (cross price elasticities = 0)
 - No change in abandonment and arbitrage
 - No short run influence of change in fuel tax on pre tax price and car demand.

The procedure of calculating the scenario is the same as shown for scenario 1.

The following table shows an overview of the results of the scenario.

	Losses in revenues from RT	Increase of CT in %		Change of base price in %		Change of retail price in %		Change of cost over lifecycle in %			
	S50 (Mio.Euro)	S50-V1	S50-V2	S50-V1	S50-V2	S50-V1	S50-V2	S50-V1	S50-V2	S50-V1	S50-V2
Austria	156.2	35.5%	17.7%	5.0%	5.2%	0.5%	0.7%	2.7%	1.8%		
Denmark	939.7	119.8%	59.9%	4.0%	4.7%	-26.3%	-26.0%	-3.2%	-12.4%		
Finland	582.0	236.9%	118.5%	2.7%	4.0%	-21.5%	-20.8%	-2.5%	-10.5%		
Germany	0.0	0%	0%	0%	0%	0%	0%	0.0%	0.0%		
Great Britain	0.0	0%	0%	0%	0%	0%	0%	0.0%	0.0%		
Greece	485.5	225.4%	112.7%	2.8%	4.1%	-11.4%	-10.4%	2.0%	-3.5%		
Ireland	252.8	77.7%	38.8%	4.5%	5.0%	-2.8%	-2.4%	5.0%	1.6%		
Italy	246.3	8.8%	4.4%	5.3%	5.3%	3.5%	3.5%	3.9%	3.6%		
Netherlands	783.4	34.1%	17.0%	5.0%	5.2%	-11.7%	-11.6%	-3.9%	-6.7%		
Change demand for new cars overall (number)		Change in revenues RT (Mio. Euro)		Change in revenues CT (Mio. Euro)		Change in revenues FT (Mio. Euro)		Tot. change revenues (Mio. Euro)			
S50-V1 (vehic.)		S50-V2		S50-V1		S50-V2		S50-V1		S50-V2	
Austria	-44382	-5882	-22.07	-2.92	-7.69	-9.39	0.00	8.99	-29.76	-3.32	
Denmark	182017	196823	1190.09	1286.90	1814.52	1304.90	0.00	43.18	3004.61	2634.88	
Finland	135459	142159	578.32	606.92	728.41	456.24	0.00	35.14	1306.73	1098.30	
Germany	0	-35	0	0	0	0	0.00	0.00	0.00	-0.03	
Great Britain	0	46	0	0	0	0	0.00	0.00	0.00	0.08	
Greece	118893	126760	220.56	235.15	347.34	208.33	0.00	33.99	567.90	477.47	
Ireland	-7931	161	-11.51	0.23	38.07	25.85	0.00	24.38	26.57	50.46	
Italy	-526878	-256591	-55.16	-26.86	-280.25	-272.76	0.00	17.75	-335.42	-281.87	
Netherlands	293095	362468	375.51	464.39	1012.55	872.49	0.00	49.07	1388.06	1385.94	

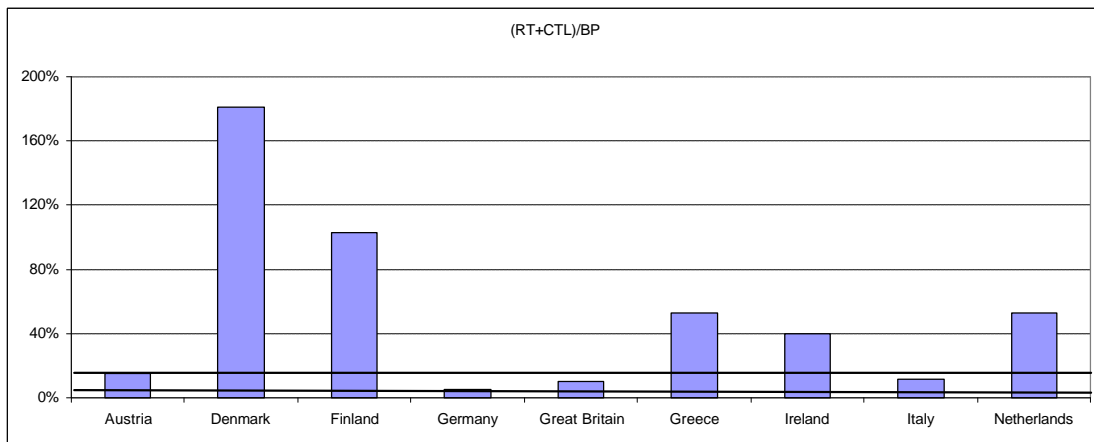
Scenario definition

The basic idea of scenario 3 is to harmonize car taxes in a manner that the differences between the countries are not bigger than the differences of the VAT in the nine countries considered.

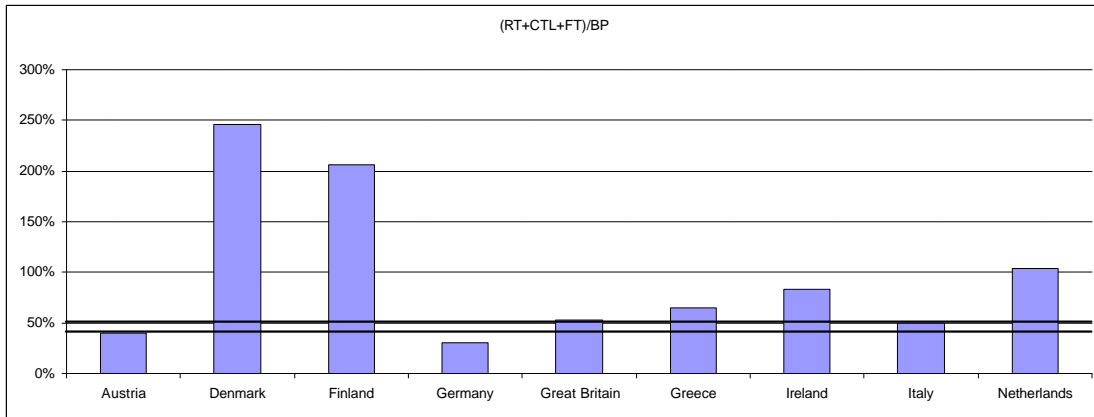
In a first step the scenario had to be defined properly. Therefore we compared three different variants. The first variant considers only registration tax and seeks to harmonize RT/BP between the countries. Variant 2 considers only the registration tax (RT) and circulation tax over lifetime (CTL), Variant 3 RT, CTL and fuel tax. The following figures are presenting the basic information of the three scenarios:



Relation of the registration tax to the base price (pre-tax price) for different countries (Variant 1)



Relation of the registration and circulation tax over lifecycle to the base price for different countries (Variant 2)



Relation of the registration, circulation and fuel tax to the base price for different countries (Variant 3)

Variant 2 definition

For further analysis, variant 2 was taken and defined as follows:

Scenario: Tax differences (sum of CT over lifecycle and RT) between countries may not exceed max. 9% of Pre Tax Price (9%, because this is the difference between the highest and the lowest VAT of the nine countries).

Compensation over fuel tax (100% of losses in fiscal revenues on FT)

Assumptions: - Car producers do not change car prices in other countries than the one which changes level of taxes (cross price elasticity's = 0)
 - No change in abandonment and arbitrage
 - No short run influence of change in fuel tax on pre tax price and car demand.

The scenario 3 is calculated as follows:

- a) Maximal allowed tax difference analogue to actual VAT differences (Highest VAT DK: 25%; lowest VAT: D 16%).
- b) Cut of RT and CT to reach the tax difference of 9%.
- c) Losses in Fiscal revenues assuming a constant motorization
- d) Compensation of these losses through an increase in the FT
- e) Calculating the resulting pre tax price after changes in RT and CT
- f) Calculating the new retail price based on the changed pre tax price.
- g) Change of motorization (demand) due to the change of the retail price
- h) Change of the fiscal revenues due to lower demand for new cars
- i) Change of the fiscal revenues due to a change in the average lifetime of the cars in use.
- j) Additional need to adjust CT in order to get the aimed fiscal neutrality per country after the reaction on motorization.

The figure above (variant 2) is showing the necessary tax adjustments. The table below is showing the concrete values.

Scenario 3	Sum of RT and CT on Pre Tax price	Necessary cut on the taxes (sum of CT and RT) in % (allowed values between 5-14%)	New taxes (CT+RT) on old taxes
Austria	15.3%	-1	93%
Denmark	181%	-167	8%
Finland	103%	-89	14%
Germany	5%	0	100%
Great Britain	10%	0	100%
Greece	53%	-39	26%
Ireland	40%	-26	35%
Italy	12%	0	100%
Netherlands	53%	-39	26%

Definition of the values for the third scenario

ANNEX

REVIEW OF ELASTICITIES

Review of existing studies

1.1. Overview of elasticity's

Car price elasticity's (tax elasticity's respectively) are an important empirical baseline to measure behavioural changes due to changes in the tax system.

A recent study commissioned by ECMT (INFRAS 1999) has evaluated different studies on elasticity's in order to analyse the impact between differentiation and variabilisation strategies, i.e. the effects of the different charging types depend on the behavioural changes induced in driving, car use, car purchase, etc. Demand elasticity's measure these behavioural changes, i.e. they indicate the demand decrease (in %) induced by a price increase (in %). In the next section we will discuss the elasticity's associated with a tax variabilisation and differentiation. We will look at:

- short and long term elasticity's
- fuel price elasticity's
- elasticity's of annual charges
- elasticity's of vehicle kilometre charges
- elasticity's of purchase taxes.

Short and long term elasticity's

The studies on elasticity's distinguish between **long** and **short term elasticity's**. Long term elasticity's consider all adjustments of car demand (or car use) to a change of the level of existing charges or to the introduction of new charges. They indicate the behavioural changes necessary for reaching a new market equilibrium. This equilibrium occurs about five years after the price change. Short term elasticity's usually refer to demand adjustments which take place within a period of less than one year. Since, in the short run, the possibilities of reaction to a price increase (or to a new tax) are smaller than in the long run, short term elasticity's are lower (in absolute values). The short term possibilities for avoiding a price increase are much more limited than in the long run, where more substitution possibilities (like the change of car demand) exist. Depending on the type of charge considered, only medium or long term demand reactions are possible (for instance the effect of a vehicle tax differentiation or a purchase tax differentiation can be measured only in the long term).

Fuel price elasticity's

The most widely studied elasticity's are the **direct fuel price elasticity's**, which indicate how the fuel demand decreases with an increase of fuel price. The range of estimated values can be explained by econometric models used for estimation (static-dynamic model, use of cross section-time series data, etc.) and country-specific features (different spatial structure, availability of public transport, initial fuel price).

Fuel consumption can be reduced without reducing car use, for example with an environmentally friendly driving behaviour. That means that, as a consequence of fuel price or tax increase, fuel consumption decreases more than car use (e.g. car mileage). The difference between these two reactions can be imputed to a specific environmental behaviour. Consequently, the elasticities related to fuel consumption are larger than those related to car use, car stock or specific environmental behaviour.

Elasticity's of annual charges

The effects of **annual charges** (costs) on car stock, fuel consumption etc. are calculated only for the long term. It can be noticed that the effect of annual charges on car stock, on fuel consumption as well as on car use is considerably lower than the effect of fuel taxation. This is not surprising since a fuel tax has a direct effect on fuel consumption and car use. The small effect of annual charges on car stock can be explained by the lack of awareness of annual costs when the decision for car owning is made.

Compared to the fuel price elasticity's, there are few studies which analyse the behavioural impact of annual charges. Besides, some of these studies do not distinguish between annual charges and annual depreciation costs, but analyse the impact of an increase of both on car use. It can be assumed that the impact on demand of an increase in annual costs is more or less the same for both kinds of costs (annual charges and capital costs).

No studies could be found which explicitly analyse the impact of a **differentiation** of annual charges on car stock and use. Therefore, the estimates of the impact of tax differentiation on car use and car stock will be based on the direct elasticity's of annual charges.

Elasticity's of vehicle kilometre charges

The elasticity's of **vehicle kilometre charges** (other than fuel taxes) show the reaction of car use when road pricing schemes are introduced. A major survey on road pricing elasticity's was carried out by the European Commission¹. This study evaluates the experience of different cities with road pricing. The estimated elasticity's consider the effect of road pricing on car use, modal split and route choice². They do not distinguish – at least not explicitly – between short- and long-term effects. The effects of road pricing on car use depend largely on the purpose of the trip: shopping and social trips have the highest, commuter trips the lowest elasticity's. The cross-price elasticity's (effect of the charge on modal split) depend on the transport mode considered (rail or metro) and on the level of the charge applied.

In Germany (Stuttgart) a field study³ was carried out to test the effectiveness of urban road pricing based on present traffic volumes. The study shows that a great behavioural reaction can be achieved even with moderate tariffs. The decrease in the road use was about 20% between Monday and Friday and 25% on Saturdays. The study aimed to record the evasive actions which have been chosen by car users: change of departure time, car pooling, change of route choice and the use of other transport modes. The field study has further identified the major problems which can arise with the introduction of a road pricing system, first of all the problem of the evasive actions which lead to an increase in traffic volume on other (not charged) roads. The different reaction patterns to road pricing were identified by interviewing the persons tested.

Elasticity's of purchase taxes

A last type of elasticity considered is the **purchase tax** elasticity. Unfortunately, it was not possible to identify any studies which analyse the specific effect of purchase taxes on car ownership and car use. We could not find studies which analysed and quantified the effects of purchase tax differentiation either.

Different studies however analyse the effects of **car price** on car use and ownership. From the theoretical point of view, it can be expected that individuals react to a car price increase exactly in the same manner as to an increase of purchase taxes. The correct use of the car price elasticity for calculating the demand effect of a purchase tax increase implies that the purchase tax increase can be set in relation to the overall price of the car.

As expected, the car price affects the car stock in the long term much more than taxes do. It is interesting that - according to the available studies - the reactions (car use, fuel consumption) on car price changes seem to be quite significant in comparison to annual vehicle charges. Here the definition of the elasticity has to be considered: The annual vehicle charges are just a small part of the annual capital cost of a vehicle. Thus it seems plausible that the corresponding elasticity's differ in the described manner.

The following TABLE 1 summarises the empirical evidence of elasticity's, based on different studies

¹ DG VII, Transport Research, APAS, Urban Transport, Pricing and Financing of Urban Transport, 1996

² The effect of road pricing on alternative routes was estimated only for one city (Milan).

³ Within this field trial, a sample of selected car drivers (test persons) reported their driving behaviour for a specific time, facing different (virtual) tariffs within the urban area (Mock-Hecker Rüdiger, Würtenberg Julian, 1998). The study is not isted in TABLE 1 since detailed elasticities of road pricing have not been estimated.

TABLE 1: SELECTED PRICE ELASTICITY'S FOR CHANGES OF DIFFERENT CHARGES. (SOURCE ECMT/INFRAS 1999)								
Effects on	Price change of							
	Fuel price/taxes		Annual charges (veh. taxes)		Vehicle km charges		Purchase taxes/car price	
	short term	long term	short term	long term	short term	long term	short term	long term
Car stock		-0.3 ^a -0.15/-0.41 ^b -0.2/-0.4 ^c -0.2 (-0.1) ^j -0.18/0.36 ^h -0.18/0.36 ^k		-0.081 ^f -0.08/-0.04 (-0.06) ^j			-0.38 ^j	-0.89 ^e (-0.4/-1.6) -0.253 ^f -0.77/-0.6 ^j -0.28/-0.57 ^k
Fuel consumption	-0.27/-0.28 ^a -0.20/-0.25 ^g	-0.71/-0.84 ^a -0.702 ^f -0.54/-0.96 ^g -1/-0.4 (-0.7) ^j		-0.055 ^f -0.16/-0.02 (-0.11) ^j				-0.529 ^f
Car use (km)	-0.16 ^a	-0.33 ^a -0.262 ^f -0.55/-0.05 (-0.3) ^j		0.062 ^f -0.04/0.8 (0) ^j -0.05/-0.15 ^h	-0.1/-0.8 ^h			-0.287 ^f
Route choice					0.43 ^h			
Modal split	0.34 ^a (0.08/ 0.8)				0.05/0.4 ^h			
Spec. envir. behav.		(-0.2/-0.4) ^d						

^a Goodwin (1992), average values of different studies

^b Hensher (1987, in Goodwin 1992), no explicit distinction between short and long term

^c Tanner (1981-83, in Goodwin 1992), no explicit distinction between short and long term

^d Goodwin (1992), values are calculated as difference between effects on fuel consumption and reduction of car use

^e Harbour (1987, in Goodwin 1992, average of more than 90 estimates reviewed)

^f Storchmann (1998), effects of annual charges and annual depreciation on car stock and on fuel demand **per capita**

^g Sterner et al. (1992), dynamic model

^h APAS, Pricing and financing of urban transport (1996), elasticity depends on the purpose of the trip, transport mode, level of road pricing

ⁱ Johansson et al. (1996), in brackets = „best guess“, **annual charges = taxation other than fuel** (sum of purchase taxes and annual taxes)

^j Vaes (1982, in APAS 1996)/Bland (1994, in APAS 1996)

^k Dargay 1998, elasticity's for different income classes, differentiated in purchase costs and running costs (used as fuel price elasticity)

ANNEX

COUNTRY REPORTS

STUDY ON VEHICLE TAXATION IN THE MEMBER STATES OF THE EUROPEAN UNION

COUNTRY REPORTS

January, 2002



CONSULTORES EM TRANSPORTES INOVAÇÃO E SISTEMAS, S.A.

In cooperation with: (as TIS.PT's sub-contractor)



Erasmus University Rotterdam



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1. Country Report : Denmark

INTRODUCTION

Denmark has had a high level of taxation on cars for many years. Denmark produces no vehicles which has been one reason for a very high car purchase taxes (registration taxes) on private cars. This has restrained car ownership but not necessarily use. As a part of its policy to obtain sustainable economic growth and redirect the existing taxation of cars towards a more environmental efficient taxation, the Danish Government has listed targets for reducing the traffic-related emissions of CO₂, CO, HC, NO_x, SO₂, lead, benzene and particulates.

By July 1997 a green vehicle tax reform was introduced with the aim of providing larger incentives to use more fuel-efficient cars – measured by the fuel consumption¹. This new green tax replaces a yearly weight tax for new cars because the link between weight and fuel consumption is not always straight forward. Thus, the weight duty sends the wrong signals in terms of environmental damage to the potential buyer. Diesel-driven cars are liable to an additional duty, an equalising duty, as the diesel fuel is taxed at a lower rate than petrol.

The differentiation of the green tax and the very high registration taxes are considered as satisfying measures to cover the financial and environmental needs. The general opinion is that – at least in the short and medium run – there are no big shifts and changes in the Danish system of transport taxation expected.

The Danish experiences show the importance of the balance between fixed and variable costs in the transport/environment equation. High car acquisition and registration costs may indeed be effective at retarding the growth of car ownership, but if variable costs are not similarly high, those households with cars use them more frequently than in countries with higher variable costs.

1.1. The elements of the vehicle taxation system

1.1.1. Acquisition Taxes

Registration Tax (RT) and VAT

Denmark has a very high car registration tax (110% in average and 180% on the margin). The first time a motor vehicle is registered in Denmark the registration tax is paid. The registration tax is a value-based vehicle tax and the taxable value includes the general sales tax (VAT) of 25%.² Supplementary technical equipment such as airbags, ABS, etc. can be deducted from the gross value and is therefore not taxable.³ For cars and vans with less than two airbags there is an additional charge. Registration tax on second hand cars being registered in Denmark for the first time is charged on the same basis as for new cars, but the actual retail price is estimated in a valuation procedure, where the car is compared to similar cars on the market having regard to all factors that might influence the price.

1 EU regulations 80/1268 and 93/116

2 The registration tax is not part of the tax base for VAT.

3 These deductions correspond to the actual costs of the equipment and are lowered with time when the equipment becomes cheaper.

Differentiation criteria and tax level:

The registration tax is based on the price (incl. VAT of 25%) of the new vehicle. It is progressively levied with increasingly higher rates for more costly vehicles.

Vehicle category	Base rate (1999)	Progressive rate (1999)
Cars	105% of first 50,800 DKK (6,820 EURO)	180% of the rest

Table 1: Registration tax rates for private vehicles in Denmark. (Source: Ministry of Taxation 1999a)

According to the Ministry of Taxation the experiences with the rather high registration taxes are very satisfying, such that changes in the system should not be undertaken easily.

High car purchase taxes restrained car ownership. In spite of this low car ownership, car use relative to GDP is similar to that of other countries. But the average distance each car is driven per year is higher than in any other European country⁴.

High purchase taxes do suppress car size somewhat, leading to lower fuel intensity because cars are small. However high purchase taxes may also restrain fleet turnover, so overall fleet intensity might not reflect advances in technology as robustly as other economies. The consequence of this high level of car and fuel taxation is that there are "only" 350 cars per 1,000 inhabitants in Denmark – compared to 495 in Germany and 411 in Sweden (figures from 1995) – presumably with an increasing trend.

- **Registration Fee**

There is a fee of Dkr 800 (+25% VAT) covering two number plates and the registration certificate.

1.1.2. Annual Circulation Tax (ACT)

At the moment there are two annual taxes on the ownership of motor vehicles.

- 1) The **annual weight duty** is a weight-based annual charge and is levied on old passenger cars (0–2 t; registered before July 1997)
- 2) On new cars (registered since July 1, 1997) the **annual green tax**⁵ came into effect at the end of 1997. The annual green tax is based on the **official fuel consumption** according to the EU standards for fuel consumption measurement, obligatory from 1997. This new tax is underlying an environmentally sound tax base. There are two tax scales, one for petrol and another one for diesel-driven cars.

4 While the average lifetime of a car in Denmark is not significantly longer than for example in Sweden (only 1–2 years), the average number of kilometres the car is driven in its lifetime is roughly 30% greater than in Sweden.

The main objective from the switch of the weight-based annual tax to the fuel consumption-based green owner tax is that the Government wished to strengthen the incentive to include environmental consideration when buying a new car. Since the weight of a car is not always properly linked to its fuel consumption, the weight duty sends the wrong signals in terms of environmental damage to the potential buyer. The green tax is constructed so as to stress the environmental effects by linking the tax level directly to fuel consumption.

Additionally, this measure gives concern to the reduction target of the CO₂ emissions. The overall goal is the maintenance of CO₂ emissions in the transport sector at the 1988 level for 2005 and a reduction of 25% in 2030 compared to 1988. Another objective was to realise a revenue neutral shift from one to the other tax system.

For old *passenger cars*, the **weight tax** varies from 1,420 DKK/yr (190 EURO) to 5,660 DKK/yr (760 EURO). The typical car is taxed at 2,360 DKK/yr (317 EURO). There is an **additional charge for diesel-driven vehicles** to equalise the tax and price difference between diesel and petrol.

Permitted total weight in kg	Suggested EU standards	
	EU 2000 standard: Annual rebate until 2000 in DKK (EURO)	EU 2000 standard: Additional rebate per year in DKK (EURO)
500–1,000	350 (47)	100 (13)
1,000–2,000	700 (94)	200 (27)
2,000–2,500	900 (121)	350 (47)
2,500–3,500	1,150 (154)	450 (60)

Table 2: Environmentally differentiated weight duty on vans in Denmark (Source: Ministry of Taxation 1998d)

The green owner tax is based on the car's potential fuel consumption according to the EC standards⁶. For petrol-driven cars, the tax varies from 420 DKK/yr (56 EURO) for cars driving > 20 km/l (< 5 l/100 km) to 15,440 DKK/yr (2,073 EURO) for cars with less than 4.5 km/l (22 l/100 km). There are 20 tax steps on the scale of fuel economy as can be seen from Table 3. The typical Danish car is taxed with 2,920 DKK/yr (392 EURO) for an average fuel economy of 12.5 km/l (8 l/km). The share of diesel-driven passenger cars is less than 2% of the car stock.

5 also "green owner tax"

6 This tax differentiation was made possible with the introduction of the fuel consumption measurements of new cars according to EU 80/1268 and 93/116 standards.

Categories of fuel consumption in km/litre		Tax rates (1998)	
maximum km/l	minimum km/l	in DKK/year	in EURO/year
	> 20.0	420	56
20.0	18.2	840	113
18.2	16.7	1,260	169
16.7	15.4	1,680	226
15.4	14.3	2,100	282
14.3	13.3	2,520	338
13.3	12.5	2,920	392
12.5	11.8	3,340	448
11.8	11.1	3,760	505
11.1	10.5	4,180	561
10.5	10.0	4,600	618
10.0	9.1	5,420	728
9.1	8.3	6,260	840
8.3	7.7	7,100	953
7.7	7.1	7,920	1,063
7.1	6.7	8,760	1,176
6.7	6.3	9,600	1,289
6.3	5.9	10,420	1,399
5.9	5.6	11,260	1,512
5.6	5.3	12,100	1,624
5.3	5.0	12,940	1,737
5.0	4.8	13,760	1,847
4.8	4.5	14,600	1,960
< 4.5		15,440	2,073

Table 3: Green tax rates for petrol-driven cars depending on fuel consumption in Denmark (Source: Ministry of Taxation 1998)

As one of the expected gains from the green owner tax is an increased fuel efficiency in new cars, the tax steps are proposed to increase by 1.5% each year in order to maintain the same level of tax pressure. The annual increase applies to new as well as old cars.

Since the excise tax on diesel is lower than on petrol (for reasons of competitiveness), the annual tax is set at a higher rate for diesel-driven cars. This equalisation tax is embraced in the green tax. The tax scale includes the fact that diesel is taxed lower than petrol and that diesel-driven cars have a higher fuel efficiency than petrol cars. Also, there is an additional annual tax for diesel-driven vehicles (passenger cars, vans and smaller trucks) liable to the weight tax. The break-even point above which driving a diesel car is cheaper is calculated at 16,000 km/yr.

Environmental objectives: The Ministry of Taxation confirmed the expected trend that people tend to buy more fuel-efficient cars within certain size categories rather than buying smaller cars with better fuel-economy performance. During one year of controls and measures a slight shift towards higher fuel efficiency could be observed: The fuel efficiency of cars was increased by 4%⁷ for an average car.

Revenue objective: The aim that the system change from the annual weight tax to the green owner tax should be a revenue neutral was adequately achieved since the revenue from this tax shift just increased by 1.5%.

The green tax is independent of the mileage and the total fuel consumption and the incentive to acquire a fuel-efficient car expressed in DKK/l is less with a high mileage than with a lower mileage.

Compared to the weight tax, the green tax will not cause significant redistribution. However, as smaller cars often have a better fuel economy they will in general meet tax relieves, while bigger cars are facing a tax raise.

The earlier weight tax has been criticised for conflicting with concerns for road safety, as heavier cars tend to be more safe. This drawback is mitigated as consumers will pay fewer taxes buying heavy, safe but fuel efficient cars.

In general, the new system favours diesel cars and small-engine petrol cars. This could in the long run effect in an increased share of diesel-driven passenger cars unless measures against it are taken.

Yet, the introduction of the differentiated green tax definitely improved the system of transport taxation. Denmark's system of high car acquisition taxes has been somewhat successful at restraining trends toward large, fuel-intensive car.

1.2. Other Relevant Informations

- Taxes on motoring

The excise tax on motor fuels is levied on petrol and diesel. It consists of an energy duty, a CO₂ tax and a sulphur tax. The differentiation is based on environmental criteria such as lead content, toxic/carcinogenic impact of exhaust outcome.

With the Danish "Green tax reform" from 1994–98, the fuel taxation is more environmentally focussed. The carbon, energy and sulphur taxes are now based on environmental or emissions criteria. The CO₂ tax (introduced in 1992) and the energy tax (levelled according to the energy content of the fuel in 1998) should help to come closer to the high targets set: A 20% reduction of CO₂ emissions in Denmark between 1988 and 2005.

The differentiation on petrol is made in 3 levels, between leaded and unleaded petrol, between stations with or without vapour recovering equipment and since July 1998 according to the benzene content (carcinogenic outcast) of the fuels.

7 This figure meets the expectations.

- 1) 0.65 DKK/l (0.087 EURO) differentiation between leaded & unleaded petrol⁸
- 2) 0.03 DKK/l (0.004 EURO) differentiation between petrol stations with and without recovering of fumes. Stations with fume recovering system is given a rebate.
- 3) Differentiation based on the content of benzene⁹.

The rebate in petrol tax is mentioned in the table below:

Year of introduction	Reduction in petrol tax [DKK/ litre petrol] depending on the benzene content				
	< 1%	1-2%	2-3%	3-4%	4-5%
1998, 1 July	-0.04	-0.02	0	+0.02	+0.04
2000, 1 January	-0.02	0	0	0	0

Table 4: Rebate of energy tax on petrol (in DKK/litre) depending on the benzene content in Denmark (Source: Ministry of Taxation 1998d)

The average tax rates on petrol in 1998 are:

- 3.35 DKK/l **unleaded** petrol, gradually increasing to 4.05 DKK/l in 2002
- 4.00 DKK/l **leaded** petrol, gradually increasing to 4.70 DKK/l in 2002

The tax on **diesel** is differentiated between normal and light diesel with 0.1 DKK/l (0.13 EURO). The differentiation criteria is – among other things – the sulphur content which is less than 0.05% for light diesel.

The average rates in 1998 are:

- 2.12 DKK/l normal diesel
- 2.02 DKK/l light diesel (minus 0.1 DKK/l)

² tax

8 The differentiation has little relevance today, as unleaded petrol covers 100% of the market of petrol.

9 Less than 50% of the petrol uses has a low benzene content. The differentiation is adjusted with increasingly better petrol performance in every summer.

Fuel type	Energy tax / litre	CO ₂ tax / litre	Total
Unleaded petrol	3.77 DKK / 0.5 EURO	–	3.77 DKK / 0.51 EURO
Leaded petrol	4.42 DKK / 0.6 EURO	–	4.42 DKK / 0.59 EURO
Normal diesel	2.12 DKK / 0.28 EURO	0.27DKK / 0.04 EURO	2.39 DKK / 0.32EURO
Light diesel	2.02 DKK / 0.27 EURO	0.27DKK / 0.04 EURO	2.29 DKK / 0.31EURO

Table 5: Fuel taxation in Denmark in 1999 (Source: Ministry of Taxation 1998c)

For fulfilling the goal of a CO₂ emission stabilisation by 2005 at the 1988 level for the transport sector, a hypothetical CO₂ tax of 2,000 DKK/t CO₂ (270 EURO) instead of 100 DKK/t CO₂ (13 EURO) should be burdened to people. The calculations made for the fixation of the CO₂ tax level to reach the CO₂ reduction goal is within the responsibility of the Ministry of Finance.

It seems difficult to reach that goal of a stabilisation in 2005 since the political framework conditions do not allow the necessary increase of the carbon tax. Overall carbon emissions per capita from travel are average for the European countries.

Differentiated fuel taxes are important and sustain the environmental objectives of the high registration taxes on private cars. It could be shown that high registration or annual taxes could lower car ownership but not prevent people from excessive car use. Therefore the incentive for less car use could probably be improved by increasing the fuel taxes.

– **Revenues from transport taxation:**

The total revenue of the vehicle and transport taxes is approx. 38 bn DKK (5.1 bn EURO) in 1998. The total revenue for all green/environmental taxes¹⁰ in Denmark is about 60 bn DKK (8 bn EURO).

The following table gives an overview about revenues resulting from transport taxation. For the CO₂ and sulphur taxes only the total revenue including other sectors than transport is available.

10 Energy taxes, excise duty on motor fuel, annual vehicle taxes, registration tax, eco taxes

Tax revenue in mio DKK (mio EURO)	1980	1990	1995	1996	1997	1998
Petrol tax	3,690 (495)	5,744 (771)	7,387 (992)	8,219 (1,103)	8,541 (1,147)	8,775 (1,178)
Weight tax	2,888 (388)	4,363 (586)	4,404 (591)	4,918 (660)	5,172 (694)	5,650 (759)
Registration tax	3,049 (409)	8,007 (1,075)	14,967 (2,009)	15,363 (2,062)	16,366 (2,197)	17,800 (2,390)
Third part liability insurance	476 (64)	933 (125)	944 (127)	1,068 (143)	1,336 (179)	1,350 (181)
Road toll	-	-	289 (39)	262 (35)	270 (36)	286 (38)
Energy tax (total)	6,557 (880)	14,150 (1,900)	17,932 (2,407)	20,006 (2,686)	20,905 (2,806)	23,475 (3,152)
CO ₂ tax (total)	-	-	3,245 (436)	3,693 (496)	3,930 (528)	4,550 (611)
SO ₂ tax (total)	-	-	-	296 (40)	396 (53)	400 (54)

Table 6: Green transport taxes in Denmark 1980–1998 (Source: Ministry of Taxation 1999)

1.3. Database - DK

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Population (millions)	5.135	5.146	5.162	5.181	5.197	5.216	5.251	5.275	5.295	5.300
Short Term Interest Rate	10,9%	9,7%	11,0%	10,4%	6,2%	6,1%	3,9%	3,7%	4,1%	3,3%
Purchasing Power Index	-	110	108	113	117	118	120	120	120	119
New Vehicle Sales (passenger)	80.654	83.685	83.679	82.013	139.680	135.773	142.430	152.084	162.508	143.727
Car Sales per 1000 Capita	16	16	16	16	27	26	27	29	31	27
Passenger Vehicles in Use - Fleet (Millions)	-	1,594	1,604	1,618	1,617	1,685	1,744	1,788	1,822	1,869
Passenger Vehicles - Diesel Share	-	-	-	-	2,7%	3,0%	3,0%	2,9%	3,7%	4,6%
Passenger Vehicles - Non Diesel Share	-	-	-	-	97,3%	97,0%	97,0%	97,1%	96,3%	95,4%
Car Ownership per 1000 capita	309	310	312	313	312	324	334	341	345	353
Car Ownership - Growth	-	-	0,4%	0,6%	-0,4%	3,9%	3,1%	1,8%	1,4%	2,1%
Average Age of vehicles (years)	7,8	8,0	8,3	8,6	8,3	8,3	8,3	8,2	-	-
GDP (billions) - (natural currency)	825	-	-	-	-	1.010	1.061	1.112	1.164	1.188
Total Tax Revenue as % of GDP	47,1%	46,9%	47,3%	48,8%	49,9%	49,4%	49,9%	50,0%	49,8%	50,6%
GDP (billions) - (EUROS)	110,6	-	-	-	-	135,3	142,1	149,0	155,9	159,2
GDP per capita (EUROS)	21.531	-	-	-	-	25.935	27.066	28.241	29.445	30.035
Registration Tax on GDP	-	-	-	-	1,43%	1,54%	-	1,47%	1,53%	1,41%
Circulation Tax on GDP	-	-	-	-	0,46%	0,45%	-	0,47%	0,49%	0,54%
Petrol Tax on GDP	-	-	-	-	0,66%	0,76%	0,77%	0,77%	0,75%	0,84%
Diesel Tax on GDP	-	-	-	-	0,31%	0,32%	-	0,35%	0,33%	0,18%
Total Vehicle Related Taxes on GDP	-	-	-	-	2,99%	3,21%	0,77%	3,05%	3,10%	2,98%
Registration Tax on Tax Revenue	-	-	-	-	2,87%	3,12%	-	2,95%	3,07%	2,79%
Circulation Tax on Tax Revenue	-	-	-	-	0,92%	0,91%	-	0,93%	0,97%	1,07%
Petrol Tax on Tax Revenue	-	-	-	-	1,32%	1,54%	1,55%	1,54%	1,51%	1,66%
Diesel Tax on Tax Revenue	-	-	-	-	0,62%	0,65%	-	0,69%	0,66%	0,35%
Registration Tax Amount (Billions Natural Currency)	-	-	-	-	-	15,6	-	16,4	17,8	16,8
Circulation Tax Amount (Billions Natural Currency)	-	-	-	-	-	4,5	-	5,2	5,7	6,5
Registration Tax Amount (Billion EUROS)	-	-	-	-	-	2,1	-	2,2	2,4	2,3
Circulation Tax Amount (Billion EUROS)	-	-	-	-	-	0,6	-	0,7	0,8	0,9
Average Registration Tax amount per new vehicle (EUROS)	-	-	-	-	-	15.343,9	-	14.446,2	14.673,7	15.659,0
Average Annual Circulation Tax per fleet vehicle (EUROS)	-	-	-	-	-	361,3	-	387,5	415,4	463,1
Petrol Tax Amount (Billions Natural Currency)	-	-	-	-	-	7,7	8,2	8,5	8,8	10,0
Diesel Tax Amount (Billions Natural Currency)	-	-	-	-	-	3,2	-	3,8	3,8	2,1
Petrol Tax Amount (Billion EUROS)	-	-	-	-	-	1,0	1,1	1,1	1,2	1,3
Diesel Tax Amount (Billion EUROS)	-	-	-	-	-	0,4	-	0,5	0,5	0,3
Total Annual Fuel Tax Amount (billion EUROS)	-	-	-	-	-	1,5	1,1	1,7	1,7	1,6
Average Fuel Tax Annual Amount per fleet vehicle (EUROS)	-	-	-	-	-	867,1	631,3	927,6	924,6	867,3
TOTAL ANNUAL VEHICLE RELATED TAXES AMOUNT (Billion EUROS)	-	-	-	-	-	4,3	1,1	4,5	4,8	4,7
AVERAGE TOTAL ANNUAL VEHICLE RELATED TAXES per fleet vehicle (EUROS)	-	-	-	-	-	2.577,1	631,3	2.543,9	2.648,8	2.534,5

2. Country Report: Finland

INTRODUCTION

Basically, the vehicle taxation system in Finland consists of a vehicle registration tax (autovero), a tax on ownership/circulation (ajoneuvovero) and fuel taxation. Environmental concerns are a growing issue and this perspective is clearly reflected in the taxation policy, as hereunder described.

2.1. The elements of the vehicle taxation system

2.1.1. Acquisition Taxes

Registration Tax (RT) and VAT

The taxable value of a vehicle for the calculation of the vehicle registration tax is the value of the car at the customs plus customs duties minus FIM 400 if the vehicle has a rear window demister and headlight washers/wipers and minus FIM 4500 if the car has a catalytic converter. This is the basis for the calculation of the vehicle registration tax that is subsequently reduced by the reduction of FIM 4600. The determination of the accurate level (%) of registration tax has a rather complex structure. Below an example of retail price formation is given for a medium sized car including the level of registration for such a car:

Car price formation (in FIM)	
Value at customs	49000
+ Customs duties	+1400
- Reduction for safety equipment	-400
- Reduction for catalytic converter	-4500
Taxable value	45500
+ Vehicle registration tax (100% - FIM 4600)	+40900
+ Increase for catalytic converter	+4500
+ Domestic expenses	+2800
+ Domestic retail margins	+20000
+ VAT of 22%	+25000
Retail price	139000

Table 7: Example of retail price formation for a medium sized car including the level of registration in Finland

The registration tax collected on a vehicle that is imported and that has been registered and used for at least 6 months is equivalent to the tax on a comparable new vehicle. However, this tax is reduced on the basis of the age of the vehicle by 0.6% per month for the first 100 month of use, by 0.9% per month of the amount left at the end of every foregoing month for the following 100 months of use and by 0.4% per month of the tax left at the end of every foregoing month for further months of use. Besides, someone immigrating to Finland obtains a reduction on the registration tax of FIM 80,000.

The calculation method in that case is made simpler as it does not require the immigrant to submit the necessary documents for the original calculation method. Registration taxation is in that case 45% of the common retail price in Finland of a comparable vehicle, unless the immigrant demands that another calculation is used in case of which he has to produce the necessary documentation. A calculation example is given below for an expensive vehicle that has been used and registered for 10 years, i.e. 120 months, and that has a rear window demister and headlamp cleaners:

Calculation of registration tax for a 10 year old car that has a comparable new retail price of FIM 300,000 in Finland (in FIM)	
Registration tax (45% of 300,000 - 4600 basic tax reduction - 400 safety equipment reduction)	130,000
- Tax reduction for a 10 year old used car, i.e. 66.62% (100 month x 0.6% = 60% plus for the following 20 months a reduction of 0,9% per month of the tax amount left at the end of the foregoing month = 6.62%)	-86,606
Car tax after reduction for a used car	43,394
- Tax reduction for immigrant	-80,000
Registration tax to be paid	0
+VAT of 22%	+0
Registration tax + VAT to be paid	0

Table 8: Calculation example for an expensive vehicle that has been used and registered for 10 years in Finland

2.1.2. Annual Circulation Tax (ACT)

Cars are subject to ownership taxation ranging from 500 - 700 FIM per year depending on the age of vehicles. Besides, on diesel-driven vehicles (i.e. vehicles using fuel other than petrol) an additional annual tax is levied to compensate for the lower tax rate on diesel fuel.

2.2. Database - FIN

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Population (millions)	4.974	4.998	5.029	5.055	5.078	5.099	5.117	5.132	5.147	5.170
Short Term Interest Rate	14,0%	13,1%	13,3%	7,8%	5,3%	5,8%	3,6%	3,2%	3,6%	-
Purchasing Power Index	-	94	87	92	91	97	96	99	101	101
New Vehicle Sales (passenger)	139.095	92.483	68.547	55.836	67.201	79.890	95.830	104.507	125.751	136.324
Car Sales per 1000 Capita	28	19	14	11	13	16	19	20	24	26
Passenger Vehicles in Use - Fleet (Millions)	-	1,923	1,936	1,873	1,873	1,888	1,930	1,935	2,008	2,108
Passenger Vehicles - Diesel Share	-	-	-	-	5,3%	6,5%	13,5%	14,6%	15,1%	16,9%
Passenger Vehicles - Non Diesel Share	-	-	-	-	94,7%	93,5%	86,5%	85,4%	84,9%	83,1%
Car Ownership per 1000 capita	389	387	387	372	371	372	379	378	391	408
Car Ownership - Growth	-	-	0,2%	-3,9%	-0,5%	0,3%	1,8%	-0,1%	3,5%	4,2%
Average Age of vehicles (years)	6,9	7,4	8,1	8,3	8,7	9,1	9,5	9,6	-	-
GDP (billions) - (natural currency)	523	-	-	-	-	565	586	636	687	716
Total Tax Revenue as % of GDP	44,7%	46,1%	45,9%	44,6%	46,6%	44,9%	47,3%	46,1%	46,2%	46,5%
GDP (billions) - (EUROS)	88,0	-	-	-	-	95,0	98,5	106,9	115,5	120,3
GDP per capita (EUROS)	17.684	-	-	-	-	18.623	19.258	20.827	22.439	23.278
Registration Tax on GDP	-	-	-	-	0,40%	0,49%	0,61%	0,66%	0,77%	0,85%
Circulation Tax on GDP	-	-	-	-	0,29%	0,31%	0,35%	0,33%	0,33%	0,33%
Petrol Tax on GDP	-	-	-	-	1,24%	1,28%	-	1,29%	-	1,54%
Diesel Tax on GDP	-	-	-	-	0,47%	0,52%	-	0,52%	-	0,46%
Total Vehicle Related Taxes on GDP	-	-	-	-	2,54%	2,72%	0,96%	2,80%	1,09%	3,18%
Registration Tax on Tax Revenue	-	-	-	-	0,86%	1,09%	1,30%	1,44%	1,66%	1,83%
Circulation Tax on Tax Revenue	-	-	-	-	0,62%	0,69%	0,74%	0,72%	0,71%	0,70%
Petrol Tax on Tax Revenue	-	-	-	-	2,66%	2,85%	-	2,80%	-	3,31%
Diesel Tax on Tax Revenue	-	-	-	-	1,01%	1,16%	-	1,13%	-	1,13%
Registration Tax Amount (Billions Natural Currency)	-	-	-	-	-	2,8	3,6	4,2	5,3	6,1
Circulation Tax Amount (Billions Natural Currency)	-	-	-	-	-	1,8	2,0	2,1	2,2	2,3
Registration Tax Amount (Billion EUROS)	-	-	-	-	-	0,5	0,6	0,7	0,9	1,0
Circulation Tax Amount (Billion EUROS)	-	-	-	-	-	0,3	0,3	0,4	0,4	0,4
Average Registration Tax amount per new vehicle (EUROS)	-	-	-	-	-	5.824,2	6.318,2	6.775,3	7.033,7	7.503,6
Average Annual Circulation Tax per fleet vehicle (EUROS)	-	-	-	-	-	155,9	177,7	183,2	187,6	186,7
Petrol Tax Amount (Billions Natural Currency)	-	-	-	-	-	7,2	-	8,2	-	11,0
Diesel Tax Amount (Billions Natural Currency)	-	-	-	-	-	2,9	-	3,3	-	3,3
Petrol Tax Amount (Billion EUROS)	-	-	-	-	-	1,2	-	1,4	-	1,9
Diesel Tax Amount (Billion EUROS)	-	-	-	-	-	0,5	-	0,6	-	0,6
Total Annual Fuel Tax Amount (billion EUROS)	-	-	-	-	-	1,7	-	1,9	-	2,4
Average Fuel Tax Annual Amount per fleet vehicle (EUROS)	-	-	-	-	-	905,3	-	999,6	-	1.141,0
TOTAL ANNUAL VEHICLE RELATED TAXES AMOUNT (Billion EUROS)	-	-	-	-	-	2,6	0,9	3,0	1,3	3,8
AVERAGE TOTAL ANNUAL VEHICLE RELATED TAXES per fleet vehicle (EUROS)	-	-	-	-	-	1.368,1	491,4	1.548,7	628,1	1.813,0

3. Country Report : Greece

3.1. The elements of vehicle taxation system

3.1.1. Acquisition Taxes

Registration Tax (RT) and VAT

The acquisition of a vehicle, new or imported as used, that is to be registered in the country for the first time, is subject to the registration tax and the VAT.

This tax is payable on vehicles under tariff classification 87.03 intended for transport of persons, vehicles under classification 87.04 intended for transport of goods and motorcycles under classification 87.11 and is paid and recovered at the time the vehicle is put into use.

Basis of assessment

For vehicles and motorcycles manufactured in Greece the amount of tax payable is assessed on engine cubic capacity and sale price. For imported vehicles it is assessed on engine cubic capacity and the assumed taxable value. For vehicles intended for transport of goods, it is assessed on the taxable value.

Passenger vehicles

New vehicles using new technology are subject to the reduced rates provided for in the Law N.º 1882/90.

Engine capacity (cc)	Conventional technology (Law No 363/1976) %	New vehicles with anti-pollution technology (Law No 1882/1990) (%)
Up to 600	Up to 48	
601 to 700	48.08 to 56	10
701 to 800	56.08 to 64	
801 to 900	64.08 to 72	
901 to 1 000	72.08 to 80	
1 001 to 1 100	80.08 to 88	20
1 101 to 1 200	88.08 to 96	
1 201 to 1 300	124.904 to 135	
1 301 to 1 400	135.304 to 145.6	
1 401 to 1 500	145.74 to 156	25
1 501 to 1 600	156.104 to 166.4	
1 601 to 1 700	166.504 to 176.8	35
1 801 to 1 900	273.752 to 288.8	45
1 901 to 2 000	288.952 to 304	
2 001 to 2 100	304.152 to 319.2	
2 101 to 2 200	319.352 to 334.4	
2 201 to 2 300	334.552 to 349.6	
2 301 to 2 400	349.752 to 364.8	75
2 401 to 2 500	364.952 to 380	
2 501 to 2 600	380.152 to 395.2	
2 601 to 2 631	395.352 to 399.912	
2 632 and above	400	

Table 9: Registration tax for passenger vehicles according to the technological level in Greece

Type of vehicle	Anti-pollution technology	Conventional technology
(a) Lorries over 3.5 tonnes of any engine capacity	5 %	6.5 %
(b) Open trucks of a gross weight up to 3.5 tonnes of any engine capacity	10 %	13 %
(c) Vans of a gross weight up to 3.5 tonnes		
up to 900 cc	8 %	10.4 %
from 901 to 1 400 cc	15 %	19.5 %
From 1 401 to 1 800 cc	20 %	26 %
From 1 801 to 2 000 cc	25 %	32.5 %
from 2 001 cc	30 %	9 %

Table 10 Registration tax for goods vehicles according to the technological level in Greece

Jeep-type vehicles: excise duty is 100% of that on passenger vehicle.

Cubic capacity	Rate
vehicles up to 1 200 cc	GRD 20 per cc
vehicles up to 1 800 cc	GRD 26 per cc
vehicles over 1 800 cc	GRD 38 per cc but not exceeding GRD 100 000

Table 11 Registration tax for used vehicles and those using conventional technology in Greece

The tax determined on the above criteria is increased by 4% for every GRD 1 000 of taxable value subject to a deduction of GRD 25 000.

The above rates are raised by 50% in the case of vehicles equipped with a Wankel-type engine. This very complex calculation gives a real rate of between 80% of the selling price (1 000 cc engine) and 400% of the selling price (2 500 cc and over).

Exemptions

On new taxis using anti-pollution technology, a special reduced rate of 15 % of the special excise duty on corresponding passenger vehicles, for private use has been applicable since 1 January 1997 (Law No 2459/97). Sub-paragraph (b) of the same section was repealed by Law No 2459/97 with effect from 1 January 1997. Competition vehicles which are suitable and are used only for competition driving (Article 10 of Law No 1573/1985).

VAT

The value-added tax at the rate of 18% is calculated on the net retail-selling price for the acquisition of new and second-hand vehicles. This corresponds to the standard rate and for the islands in the prefectures of Lesvos, Khios, Samos, the Dodecanese, the Cyclades and the Aegean islands of Thasos, Samothraki, the northern Sporades and Skiros, the rates are reduced by 30% to 3%, 6% and 13% respectively.

Transactions pertaining to a commercially taxable person or entity are subject to VAT, however private sales between individuals do not give rise to a VAT charge

3.1.2. Annual Circulation Tax (ACT)

The road tax on motor vehicles is payable on motor vehicles and motorcycles used on public roads is paid by the owners of the vehicles and is collected in an annual basis.¹¹

Basis of assessment

- For vehicles required to pay road tax via the purchase of a special sticker: engine capacity in cubic centimetres.
- For private goods vehicles, including load-carrying motor tricycles: the loading capacity and in some cases horsepower.
- For buses and coaches: the number of seats.
- For public goods vehicles, including load-carrying motor tricycles: the horsepower and the loading capacity.

Private motor vehicles

(Road tax for categories 1, 2 and 3 above is paid by the purchase of a sticker with a face value equal to the amount of the tax. A sticker with a nominal value of GRD 2 000 is issued for vehicles as above which are exempt from road tax.)

¹¹ For the road sticker, it is paid in one instalment and in other cases in two six-monthly instalments.

(a) Passenger and jeep-type vehicles for passengers and freight:	
from 51 to 300 cc	GRD 4 000;
from 301 to 785 cc	GRD 10 000;
from 786 to 1 357 cc	GRD 25 000;
from 1 358 to 1 927 cc	GRD 45 000;
from 1 928 to 2 357 cc	GRD 100 000;
from 2 358 cc and over	GRD 130 000.
(b) Passenger motor bicycles and tricycles	
from 51 to 300 cc	GRD 4 000;
from 301 to 785 cc	GRD 10 000;
from 786 to 1 357 cc	GRD 25 000;
from 1 358 cc and over	GRD 45 000.
(c) Passenger trailer and semi-trailer (caravans)	GRD 25 000.
(d) Lorries, trailers, semi-trailers and cement-mixers	GRD 16 per kg of payload.
(e) Hearses	GRD 600 per HP.
(f) Tractors	GRD 325 per HP.
(g) Buses and coaches	GRD 1 625 per seat.
(h) Other motor vehicles	GRD 1 137 per HP.
(i) Load-carrying motor tricycles	GRD 16 per kg of payload

Table 12: Road tax on motor vehicles in Greece

(a) Passenger vehicles	GRD 20 000.
(b) Lorries, trailers, semi-trailers and cement-mixers	GRD 5 per kg of payload.
(c) Tractors	GRD 81 per HP.
(d) Petrol-powered buses and coaches	GRD 114 per seat.
Petrol-powered buses and coaches for goods and passengers	GRD 114 per seat and GRD 1 per kg of payload;
Diesel-powered buses and coaches for goods and passengers	GRD 187 per seat and GRD 1 per kg of payload.
(e) Diesel-powered buses and coaches, provincial urban services	GRD 114 per seat.
(f) Diesel-powered buses and coaches, inter-city-services	GRD 284 per seat.
(g) Other (tourist coaches)	GRD 1 625 per seat.
(h) Motor vehicles not belonging to any of the above categories	GRD 244 per HP.
(i) Load carrying motor tricycles	GRD 5 per kg of payload.

Table 13 : Road tax on publicly used vehicles

Exemptions

- Vehicles belonging to the Greek State, to heads of diplomatic missions and the official diplomatic staff of foreign embassies, to the Greek Red Cross and several other non-profit-making institutions.
- Vehicles for disabled people who meet certain conditions.

3.2. Database - EL

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Population (millions)	10.121	10.200	10.294	10.349	10.410	10.443	10.465	10.487	10.511	10.552
Short Term Interest Rate	19,9%	22,7%	23,5%	23,5%	24,6%	16,4%	13,8%	12,8%	14,0%	10,3%
Purchasing Power Index		61	62	64	65	66	67	66	67	67
New Vehicle Sales (passenger)	115.480	167.737	199.094	147.789	109.544	125.023	139.821	159.867	180.145	261.711
Car Sales per 1000 Capita	11	16	19	14	11	12	13	15	17	25
Passenger Vehicles in Use - Fleet (Millions)		1,749	1,881	1,991	2,111	2,240	2,240	2,401	2,568	2,672
Passenger Vehicles - Diesel Share					2,3%	2,0%	2,2%	1,6%	0,8%	1,3%
Passenger Vehicles - Non Diesel Share					97,7%	98,0%	97,8%	98,4%	99,2%	98,7%
Car Ownership per 1000 capita	171	173	184	193	204	215	214	229	245	253
Car Ownership - Growth			6,7%	4,9%	5,5%	5,5%	-0,3%	7,0%	6,7%	3,4%
Average Age of vehicles (years)	10,1	9,6	9,0	8,9	9,3	9,4	9,5	9,5	-	-
GDP (billions) - (natural currency)	13.310					27.235	29.935	33.022	35.911	37.132
Total Tax Revenue as % of GDP	29,4%	29,5%	30,5%	31,0%	31,3%	31,7%	31,8%	33,7%	33,6%	34,1%
GDP (billions) - (EUROS)	39,1	-	-	-	-	79,9	87,9	96,9	105,4	109,0
GDP per capita (EUROS)	3.859	-	-	-	-	7.654	8.395	9.241	10.026	10.327
Registration Tax on GDP	-	-	-	-	0,52%	0,56%	-	0,44%	0,46%	0,64%
Circulation Tax on GDP	-	-	-	-	0,14%	0,29%	-	0,33%	0,31%	0,33%
Petrol Tax on GDP	-	-	-	-	1,74%	1,62%	-	1,44%	-	1,41%
Diesel Tax on GDP	-	-	-	-	0,77%	0,74%	-	1,02%	-	0,91%
Total Vehicle Related Taxes on GDP	-	-	-	-	3,17%	3,20%	-	3,23%	0,76%	3,29%
Registration Tax on Tax Revenue	-	-	-	-	1,66%	1,77%	-	1,31%	1,36%	1,88%
Circulation Tax on Tax Revenue	-	-	-	-	0,45%	0,91%	-	0,99%	0,91%	0,96%
Petrol Tax on Tax Revenue	-	-	-	-	5,56%	5,11%	-	4,26%	-	4,13%
Diesel Tax on Tax Revenue	-	-	-	-	2,46%	2,33%	-	3,04%	-	3,04%
Registration Tax Amount (Billions Natural Currency)	-	-	-	-	-	152,5	-	145,3	163,7	237,9
Circulation Tax Amount (Billions Natural Currency)	-	-	-	-	-	79,0	-	110,0	110,0	121,4
Registration Tax Amount (Billion EUROS)	-	-	-	-	-	0,4	-	0,4	0,5	0,7
Circulation Tax Amount (Billion EUROS)	-	-	-	-	-	0,2	-	0,3	0,3	0,4
Average Registration Tax amount per new vehicle (EUROS)	-	-	-	-	-	3.580,1	-	2.667,3	2.667,3	2.667,3
Average Annual Circulation Tax per fleet vehicle (EUROS)	-	-	-	-	-	103,5	-	134,5	125,7	133,3
Petrol Tax Amount (Billions Natural Currency)*	-	-	-	-	-	441,2	-	474,0	-	523,1
Diesel Tax Amount (Billions Natural Currency) *	-	-	-	-	-	201,5	-	338,0	-	338,0
Petrol Tax Amount (Billion EUROS)*	-	-	-	-	-	1,3	-	1,4	-	1,5
Diesel Tax Amount (Billion EUROS)*	-	-	-	-	-	0,6	-	1,0	-	1,0
Total Annual Fuel Tax Amount (billion EUROS)*	-	-	-	-	-	1,9	-	2,4	-	2,5
Average Fuel Tax Annual Amount per fleet vehicle (EUROS)*	-	-	-	-	-	842,1	-	992,5	-	945,8
TOTAL ANNUAL VEHICLE RELATED TAXES AMOUNT (Billion EUROS)*	-	-	-	-	-	2,6	-	3,1	-	3,6
AVERAGE TOTAL ANNUAL VEHICLE RELATED TAXES per fleet vehicle (EUROS)*	-	-	-	-	-	1.141,8	-	1.304,5	-	1.340,5

(*) Estimates for 1998/1999

4. Country Report : Ireland

4.1. The elements of the vehicle taxation system

4.1.1. Acquisition Taxes

Registration Tax (RT) and VAT

There are two different taxes related to vehicle acquisition in Ireland: VAT and the vehicle registration tax. The legal base for the VAT is the value added Tax act from 1972, latest amended by the Finance act from 1998. The VAT beneficiary is the central government. The acquisition of a new vehicle gives rise to a VAT charge at a rate of 21%¹² over the vehicle base price and in the case of second-hand vehicle transaction, where a registered motor trader is intervening, the VAT rate applied is also 21%.

In the case of sales between individuals, the VAT is not applied. Another element concerning the VAT over vehicles is that the tax paid by an enterprise on the purchase of a car is not deductible, but on the other hand, the VAT on commercial vehicles is reclaimable.

The other tax on acquisition is the vehicle registration tax. The legal base for the vehicle registration tax is the Finance Act from 1992, as amended by subsequent Finance Acts, being the central government the beneficiary of this tax. The tax is payable on all type of vehicles, including motorcycles and is determined as a percentage of the value of the vehicle.¹³ The payment takes place when the vehicle is registered for the first time in the country or when a conversion of a vehicle (already registered in the country) renders to a higher tax rate. The tax is payable by the registered owner of the vehicle, but the payment is usually made by the motor dealer on behalf of the customer. For second-hand cars and small commercial vehicles the tax will be calculated based on the 'OMSP'¹⁴, that should be applicable to that vehicle if it were on sale in the country. The annual rate of depreciation for motor vehicles is 20% of the residual value, however there is a limit of 16.500 Irish pounds for the depreciation allowance on private vehicles.

The chart below contains the different rates applied according to the classification category and weight criteria.

¹² The standard rate applicable to most other supplies of goods and services.

¹³ The chargeable value of the vehicle (categories A and B) is based on the 'Open Market Selling Price (OMSP) of the vehicle which is defined in the Irish law.

¹⁴ The chargeable value of the vehicle (categories A and B) is based on the 'Open Market Selling Price (OMSP) of the vehicle which is defined in the Irish law.

Vehicle Registration Tax rates

Classification category	Tax rate	Weight criteria
Category A (mainly motor cars and similar vehicles designed to transport people):	Subject to a minimum tax of IEP 250	less or equal than 3 tonnes unladen weight
	exceeding 2 000 cc: 30 % of the value of the vehicle*	
	from 1 401 cc to 2 000 cc: 25 % of the value of the vehicle*	
Category B (e.g. car-derived vans, certain 'Jeeps' type vehicles, certain crew cabs, certain motor caravans)	Subject to a minimum tax of IEP 100	** less or equal than tonnes unladen weight
	13,30 % of the value of the vehicle*	
Category C (e.g. commercial lorries, tractors, large vans)	IEP 40 per vehicle	more than 3 tonnes unladen weight
Category D (e.g. ambulances, fire engines, refuse carts)	Nil	

* Based on the 'open market selling price' of the vehicle defined in the law

**Additional lower weight and cubic capacity parametres apply in certain circumstances

There are some exemptions in the application of the VRT which are related to the following special cases:

- Special purpose vehicles not intended for use in a public place or vehicles designed and constructed for off-road use (except racing vehicles, scrambling and other sporting vehicles).
- 'Category D' vehicles' namely an invalid carriage, refuse carts, sweeping machines, watering machines used exclusively for cleaning public streets and roads, ambulances, road rollers, fire engines, fire-escapes, vehicles used exclusively for the transport (whether by carriage or traction) of road construction machinery, used only for the construction or repair of roads and vehicles used exclusively for the transport (whether by carriage or traction) of life boats and their gear or any equipment for the affording of assistance in the preservation of life and property in cases of shipwreck or distress at sea.
- Subject to certain conditions and restrictions vehicles in the following situations are exempt:

- in connection with a transfer of normal residence;
 - in connection with a transfer of a business undertaking;
 - following acquisition by inheritance;
 - gifts, donations from approved official bodies, public authorities or groups outside the State to similar groups, etc., in the State;
 - official use by institutions of the European Communities and the European Foundation for the Improvement of Living and Working Conditions and personal use for officials and staff of these institutions who transfer residence to the State;
 - under diplomatic, consular, or similar arrangements;
 - in the establishment or maintenance of an international air service using a State airport, the establishment or maintenance of radio or meteorological services ancillary to such service and when used for experimental purposes in connection with the establishment and maintenance of such international air service.
- A vehicle which is brought temporarily into the State.

Note: while the above vehicles are exempt from payment of tax, registration is required in most instances.

4.1.2. Annual Circulation Tax (ACT)

The legal base for the vehicle ownership tax in force in Ireland is the Finance Excise Duties (Vehicles) Act from 1952, as amended by certain subsequent statutes, and the Road Vehicles (Registration and Licensing) regulation from 1982 (and amendments thereto). The tax is payable by the keeper of the vehicle, and the respective payment can be made on a annual, half-yearly basis (however if the yealy rate of duty is below IEP 70 the payment should be made on an annual basis)

The following chart shows the different tax rates:

Cubic centimetres	IEP
Up to and including 1 000 cc	98
1 001 to 1 100	146
1 101 to 1 200	160
1 201 to 1 300	173
1 301 to 1 400	186
1 401 to 1 500	200
1 501 to 1 600	247
1 601 to 1 700	262
1 701 to 1 800	306
1 801 to 1 900	232
1 901 to 2 000	340
2 001 to 2 100	435
2 101 to 2 200	456
2 201 to 2 300	477
2 301 to 2 400	497
2 401 to 2 500	518
2 501 to 2 600	607
2 601 to 2 700	631
2 701 to 2 800	654
2 801 to 2 900	677
2 901 to 3 000	701
3 001 or more	849

Table 14: Vehicle duties rates

There are some exemptions regarding the payment of the vehicle duties:

- Chiefly ambulances, fire-engines, road rollers, sweeping and watering machines, vehicles used for the carriage of road construction machinery; vehicles used exclusively for the transport of lifeboats and their gear, etc. and vehicles for invalids (subject to certain conditions).
- Visitors for up to one year subject to compliance with international circulation orders.

4.2. Database - IRL

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Population (millions)	3.507	3.521	3.547	3.569	3.583	3.598	3.620	3.652	3.694	3.735
Short Term Interest Rate	11,4%	10,4%	12,4%	9,3%	5,9%	6,3%	5,4%	6,1%	5,5%	
Purchasing Power Index	-	77	80	83	88	93	94	104	106	111
New Vehicle Sales (passenger)	82.584	68.440	68.415	64.161	80.402	86.959	115.199	136.662	145.702	174.242
Car Sales per 1000 Capita	24	19	19	18	22	24	32	37	39	47
Passenger Vehicles in Use - Fleet (Millions)	-	0.837	0.858	0.891	0.939	0.990	1.057	1.134	1.197	1.344
Passenger Vehicles - Diesel Share	-	-	-	-	16,6%	16,0%	13,3%	11,3%	12,2%	12,6%
Passenger Vehicles - Non Diesel Share	-	-	-	-	83,4%	84,0%	86,7%	88,7%	87,8%	87,4%
Car Ownership per 1000 capita	225	239	244	251	263	276	294	313	328	360
Car Ownership - Growth	-	-	2,1%	3,1%	4,7%	5,0%	6,3%	6,6%	4,6%	9,8%
Average Age of vehicles (years)	6,2	6,2	6,4	6,6	6,6	6,6	6,1	5,5	-	-
GDP (billions) - (natural currency)	29	-	-	-	-	41	45	52	60	65
Total Tax Revenue as % of GDP	34,0%	33,6%	34,2%	34,5%	35,7%	33,1%	33,2%	32,8%	32,2%	31,9%
GDP (billions) - (EUROS)	36,2	-	-	-	-	52,1	57,4	65,8	75,7	83,1
GDP per capita (EUROS)	10.319	-	-	-	-	14.469	15.854	18.010	20.486	22.247
Registration Tax on Tax Revenue	-	-	-	-	2,18%	2,30%	-	3,67%	3,25%	2,91%
Circulation Tax on Tax Revenue	-	-	-	-	1,88%	1,96%	-	1,67%	1,55%	1,56%
Petrol Tax on Tax Revenue	-	-	-	-	3,05%	3,11%	-	3,72%	3,45%	3,48%
Diesel Tax on Tax Revenue	-	-	-	-	1,90%	2,02%	-	2,05%	1,90%	2,23%
Total Vehicle Related Taxes on Tax Revenue	-	-	-	-	9,01%	9,40%	-	11,11%	10,15%	10,19%
Registration Tax on GDP	-	-	-	-	0,78%	0,76%	-	1,20%	1,05%	0,93%
Circulation Tax on GDP	-	-	-	-	0,67%	0,65%	-	0,55%	0,50%	0,50%
Petrol Tax on GDP	-	-	-	-	1,09%	1,03%	-	1,22%	1,11%	1,11%
Diesel Tax on GDP	-	-	-	-	0,68%	0,67%	-	0,67%	0,61%	0,71%
Registration Tax Amount (Billions Natural Currency)	-	-	-	-	-	0,312	-	0,623	0,623	0,607
Circulation Tax Amount (Billions Natural Currency)	-	-	-	-	-	0,267	-	0,284	0,297	0,326
Registration Tax Amount (Billion EUROS)	-	-	-	-	-	0,396	-	0,791	0,791	0,771
Circulation Tax Amount (Billion EUROS)	-	-	-	-	-	0,338	-	0,361	0,377	0,414
Average Registration Tax amount per new vehicle (EUROS)	-	-	-	-	-	4550	-	5788	5429	4423
Average Annual Circulation Tax per fleet vehicle (EUROS)	-	-	-	-	-	342	-	318	315	308
Petrol Tax Amount (Billions Natural Currency)	-	-	-	-	-	0,422	-	0,632	0,662	0,727
Diesel Tax Amount (Billions Natural Currency)	-	-	-	-	-	0,275	-	0,349	0,366	0,466
Petrol Tax Amount (Billion EUROS)	-	-	-	-	-	0,536	-	0,803	0,841	0,924
Diesel Tax Amount (Billion EUROS)	-	-	-	-	-	0,349	-	0,443	0,464	0,591
Total Annual Fuel Tax Amount (billion EUROS)	-	-	-	-	-	0,885	-	1,245	1,305	1,515
Average Fuel Tax Annual Amount per fleet vehicle (EUROS)	-	-	-	-	-	894	-	1098	1090	1127
TOTAL ANNUAL VEHICLE RELATED TAXES AMOUNT (Billion EUROS)	-	-	-	-	-	1,614	-	2,397	2,474	2,700
AVERAGE TOTAL ANNUAL VEHICLE RELATED TAXES per fleet vehicle (EUROS)	-	-	-	-	-	1630	-	2114	2067	2008

5. Country Report : The Netherlands

INTRODUCTION

The current structure of the vehicle taxation system has been rather stable over the last years. Two major changes took place in the last decade. First in 1991, an increase in fuel taxation has been introduced of 0.18 guilders per litre petrol (diesel 0.07 guilders) with the aim of reducing the central government's financing deficit. Although being introduced as a temporary increase in taxation, it has received a permanent nature. In 1999, the revenue from this 'quarter' has been 1.4 billion guilders. Second in January 1993, the tax on vehicle acquisition has been revised under influence of European legislation.

A general policy aim is to make vehicle taxation more proportional to usage. The purpose is to charge for vehicle usage instead of ownership. Fuel taxation has already been raised to a level that cross-border problems arise from tax avoiding behaviour by car drivers that refuel in Belgium and Germany. Hence, other variable forms of taxation (i.e. alternatives to fuel taxation) are investigated. For some time, discussions have been ongoing on congestion charging. The latest variant that was sent to the Parliament on May, 30th 2000 foresees a compensation by reducing vehicle ownership taxation (MRB). However, political support for congestion pricing is lacking. Instead, the Parliament would favour a more quickly introduction of an electronic kilometre charging system that has been foreseen for 2001. The technological feasibility of such a system is currently under investigation.

5.1. The elements of the vehicle taxation system

The vehicle taxation system has basically three elements: a vehicle acquisition tax (BPM), a tax on vehicle ownership (MRB) and a tax on fuel

5.1.1. Acquisition Taxes

Registration Tax (RT) / Vehicle acquisition taxation (BPM) and VAT

A tax on new vehicles (so-called BPM) is levied of 45.2 % on the pre-tax catalogue price (i.e. manufacturer's price) of the vehicle. The resulting amount of taxation is reduced by NLG 3,394 for petrol and LPG cars and increased by NLG 722 for diesel cars. Besides, also a general VAT of 19% is charged on the pre-tax catalogue price (since 2001 VAT is 19% instead of 17.5% due to a revision of the overall Dutch taxation system decreasing income taxation and increasing taxation on consumption). For example, a vehicle with a consumer (retail) price of NLG 42,000 constitutes of the following elements:

Pre-tax catalogue price	NLG 27,646
+ BPM (45.2% on pre-tax price - NLG 3,394 for petrol and LPG cars)	+NLG 9,102
+ VAT (19% on pre-tax price)	+NLG 5,253
Consumer (retail) price	NLG 42,000

Table 15: Elements of a vehicle with a consumer (retail) price of NLG 42,000

BPM is also charged on imported cars. However, the amount is calculated in the same way as for new cars (using the original catalogue value of the car in the Netherlands) but reduced by a percentage depending on the age of the car. The reductions are based on the average depreciation of cars and are as follows:

Period between date of first usage and date of registration	Reduction percentage
< 1 month	4
1 month period < 2 months	7
2 months period < 3 months	10
3 months period < 6 months	15
6 months period < 1 year	24
1 year period < 2 years	37
2 years period < 3 years	47
3 years period < 4 years	57
4 years period < 5 years	66
5 years period < 6 years	72
6 years period < 7 years	77
7 years period < 8 years	82
8 years period < 9 years	86
9 years period < 25 years	90
25 years	100

Table 16: BPM reduction depending on the age of the car

No restitution of BPM is given for cars that are registered in the Netherlands and that are subsequently exported.

5.1.2. Annual Circulation Tax (ACT)

- **Tax on vehicle ownership (MRB)**

A circulation tax is charged depending on a car's weight, type of fuel used and province of residence of the owner. Other types of vehicles such as motorcycles and heavy goods vehicle have similar taxation on vehicle ownership. For cars the yearly amounts are as follows (indicating the amounts for the cheapest province and the most expensive province respectively):

Registration tax (in guilders per year)				
Weight of car (in kg) \ Type of fuel	Petrol	Diesel	Natural gas and G3 system LPG	Other (a.o. LPG)
< 550	146-184	548-568	146-184	624-640
551-650	220-244	672-	220-	768-792
651-750	280-304	800-828	280-304	920-944
751-850	372-408	964-996	372-408	1104-1140
851-950	496-540	1184-1228	584-628	1296-1336
951-1050	648-704	1404-1464	824-880	1528-1588
1051-1150	796-868	1628-1700	1060-1132	1764-1836
1151-1250	948-1036	1848-1936	1300-1388	2000-2088
1251-1350	1096-1200	2068-2172	1536-1640	2236-2336
1351-1450	1248-1364	2292-2408	1776-1892	2468-2588
1451-1550	1400-1532	2512-2644	2016-2148	2704-2836
1551-1650	1548-1696	2736-2880	2252-2400	2940-3088
1651-1750	1700-1860	2956-3116	2492-2651	3176-3336
1751-1850	1852-2028	3176-3356	2732-2908	3412-3588
1851-1950	2000-2192	3400-3592	2968-3160	3644-3836
1951-2050	2152-2356	3620-3828	3208-3412	3880-4088
2051-2150	2304-2524	3844-4064	3448-3668	4116-4336
2151-2250	2452-2688	4064-4300	3684-3920	4352-4588
2251-2350	2604-2856	4284-4536	3924-4176	4584-4836
2351-2450	2752-3020	4508-4772	4160-4428	4820-5088
2451-2550	2904-3184	4728-5008	4400-4680	5056-5336

Table 17: Tax on vehicle ownership (MRB)

In mln NLG	Vehicle acquisition taxation (BPM) on cars and motorcycles	Vehicle ownership taxation (MRB)	Fuel taxation (light oils), i.e. petrol, LPG	Fuel taxation (other mineral oils, non light oils), i.e. diesel
1999	6232	4359	6940	4566
1998	5278	3996	6625	4266
1997	4551	4004	6403	4088
1996	4370	5001	6118	3669
1995	3942	4662	5896	3512
1994	3629	4688	5667	3356
1993	3300	4751	5224	2910
1992	3212	3983	4600	2182
1991	2861	3733	4028	1964
1990	2615	3660	3706	1782

Table 18: Revenues from vehicle taxation (These revenues from vehicle taxation are not earmarked)

5.2. Database - NL

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Population (millions)	14.893	15.010	15.129	15.239	15.342	15.424	15.494	15.567	15.654	15.760
Short Term Interest Rate	8,7%	9,3%	9,4%	6,9%	5,2%	4,4%	3,0%	3,3%	3,4%	-
Purchasing Power Index	-	104	104	106	107	109	107	113	116	116
New Vehicle Sales (passenger)	502.627	490.755	491.970	391.904	434.004	447.942	471.989	478.290	543.056	611.488
Car Sales per 1000 Capita	34	33	33	26	28	29	30	31	35	39
Passenger Vehicles in Use - Fleet (Millions)	-	5,224	5,297	5,411	5,558	5,633	5,740	5,931	6,120	6,438
Passenger Vehicles - Diesel Share	-	-	-	-	12,0%	14,0%	15,3%	17,1%	19,7%	21,5%
Passenger Vehicles - Non Diesel Share	-	-	-	-	88,0%	86,0%	84,7%	82,9%	80,3%	78,5%
Car Ownership per 1000 capita	368	351	353	358	365	367	372	383	393	408
Car Ownership - Growth	-	-	0,6%	1,3%	2,0%	0,7%	1,4%	2,9%	2,7%	3,9%
Average Age of vehicles (years)	5,9	6,0	6,1	6,4	6,6	6,8	6,9	7,0	-	-
GDP (billions) - (natural currency)	538	-	-	-	-	666	694	735	776	806
Total Tax Revenue as % of GDP	42,8%	45,3%	44,9%	45,2%	43,0%	41,9%	48,0%	42,0%	41,0%	40,3%
GDP (billions) - (EUROS)	244,1	-	-	-	-	302,2	315,1	333,5	352,2	366,0
GDP per capita (EUROS)	16.389	-	-	-	-	19.594	20.334	21.422	22.501	23.221
Registration Tax on Tax Revenue	-	-	-	-	1,40%	1,48%	1,31%	1,47%	1,66%	1,92%
Circulation Tax on Tax Revenue	-	-	-	-	1,91%	1,86%	1,50%	1,30%	1,26%	1,34%
Petrol Tax on Tax Revenue	-	-	-	-	2,21%	2,27%	1,84%	2,07%	2,08%	2,14%
Diesel Tax on Tax Revenue	-	-	-	-	1,35%	1,38%	1,10%	1,32%	1,34%	1,40%
Total Vehicle Related Taxes on Total Tax Revenue	-	-	-	-	6,87%	6,99%	5,56%	6,35%	6,74%	7,37%
Registration Tax on GDP	-	-	-	-	0,60%	0,62%	0,63%	0,62%	0,68%	0,77%
Circulation Tax on GDP	-	-	-	-	0,82%	0,78%	0,72%	0,54%	0,51%	0,54%
Petrol Tax on GDP	-	-	-	-	0,95%	0,95%	0,88%	0,87%	0,85%	0,86%
Diesel Tax on GDP	-	-	-	-	0,58%	0,58%	0,53%	0,56%	0,55%	0,57%
Registration Tax Amount (Billions Natural Currency)	-	-	-	-	-	4,129	4,370	4,551	5,278	6,232
Circulation Tax Amount (Billions Natural Currency)	-	-	-	-	-	5,195	5,001	4,004	3,996	4,359
Registration Tax Amount (Billion EUROS)	-	-	-	-	-	1,874	1,983	2,065	2,395	2,828
Circulation Tax Amount (Billion EUROS)	-	-	-	-	-	2,357	2,269	1,817	1,813	1,978
Average Registration Tax amount per new vehicle (EUROS)	-	-	-	-	-	4183	4201	4318	4410	4625
Average Annual Circulation Tax per fleet vehicle (EUROS)	-	-	-	-	-	418	395	306	296	307
Petrol Tax Amount (Billions Natural Currency)	-	-	-	-	-	6,327	6,118	6,403	6,625	6,94
Diesel Tax Amount (Billions Natural Currency)	-	-	-	-	-	3,863	3,669	4,088	4,266	4,566
Petrol Tax Amount (Billion EUROS)	-	-	-	-	-	2,871	2,776	2,906	3,006	3,149
Diesel Tax Amount (Billion EUROS)	-	-	-	-	-	1,753	1,665	1,855	1,936	2,072
Total Annual Fuel Tax Amount (billion EUROS)	-	-	-	-	-	4,624	4,441	4,761	4,942	5,221
Average Fuel Tax Annual Amount per fleet vehicle (EUROS)	-	-	-	-	-	821	774	803	808	811
TOTAL ANNUAL VEHICLE RELATED TAXES AMOUNT (Billion EUROS)	-	-	-	-	-	8,855	8,694	8,643	9,150	10,027
AVERAGE TOTAL ANNUAL VEHICLE RELATED TAXES per fleet vehicle (EUROS)	-	-	-	-	-	1572	1515	1457	1495	1558

6. Country Report : Austria

INTRODUCTION

The changes in taxes in Austria over the past decade are based on two evolutions. The integration of the country to the European Union made adjustments necessary. The adaptation of the VAT has to be mentioned in this context. Another trend is the promotion of more ecological cars.

The circulation tax encourages to buy less powerful cars and catalytic converters. As this incentive seems to be insufficient, actually, works are in progress to transform the registration tax to a more ecological tax. In the framework of a general reform towards a more ecological tax system, the possibility of an increase of the annual registration tax has been analysed. The proposal of the commission consists of a monthly increase in 2 ATS/kW, i.e. an increase from 5 to 7 ATS (if the tax is paid once for the whole year). In the meantime, the tax allowance should decrease from 24 to 20 kW. Due to the switch to the EURO, the tax shall be expressed in terms of the new European currency (0.5 EURO/kW). The revenue would increase by more or less 50%.

The objectives of the proposals are:

- to reduce the trend towards more powerful vehicles,
- to stop the trend towards diesel-driven vehicles,
- to adapt the tax to price level increases in the last years (tax rate has not been adapted since 1984),
- to make some further steps towards a more ecological tax system. A first step in this direction was carried out with the change of the tax basis from the cubic capacity to the engine power of vehicles (since 1st may 1993).

6.1. The elements of the vehicle taxation system

6.1.1. Acquisition Taxes

Registration Tax (RT) *and* VAT

The registration tax, introduced 1992, was to compensate the losses of the cut of the VAT for purchase of cars (VAT was reduced from 32 to 20%). The VAT of 20% for purchase of cars lays somewhat in the average of Europe. Before 1992 there were three VAT rates in Austria: 10% (for example on food), 20% (normal rate of VAT) and 32% (luxury VAT rate, e.g. on cars). The luxury VAT rate was abolished in order to conform the tax system to the EU requirement, in view of a membership of Austria into the EU. In order to guarantee the fiscal revenues, the luxury tax was replaced by an "EU-suitable" differentiated registration tax.

The tax basis is the price of the car (including VAT). The tax has to be paid when the first registration of private cars and motorcycles takes place.

The tax rate is based on the car's fuel consumption reduced by 2 litres for petrol cars and 3 litres for diesel cars, respectively. The adjusted consumption is multiplied by the factor 0.02 in order to reach the total tax rate.¹⁵ The specific fuel consumption is based on the MVEG and ECE values¹⁶. For foreign vehicles without a confirmation of consumption the average consumption is estimated to be 0.2 of the power measured in kWh.

Private cars with **fuel** engines:

$$(\text{MVEG/ECE-fuel consumption} - 3) * 2 = \text{percentage}$$

Private cars with **diesel** engines:

$$(\text{MVEG/ECE-fuel consumption} - 2) * 2 = \text{percentage}$$

The tax is restricted to a maximum rate of 16% (until 1996: 14%) because of pressure coming from the car supplying industry (Austrian firms supplying the European automobile market). The differentiation between diesel and petrol driven engines and according to fuel consumption has been introduced in order to stop the trend towards diesel-driven cars and cars with a high engine power. This provides incentives for small and fuel-efficient cars. The financial aims of the registration tax could be achieved but there were no significant changes in the purchase behaviour of car drivers.

Electric cars as well as vehicles which are used for the ambulance service, the transport of diseased persons, rental cars and cars used in driving schools are exempt from the tax.

6.1.2. Annual Circulation Tax (ACT)

The differentiated annual vehicle tax is an engine related tax. The tax is charged on vehicles with a total weight up to 3.5 tons. The tax is paid together with the insurance tax .

The tax is differentiated according to the engine's power of the vehicle. The tax is calculated as:

$$(\text{kW} - 24) * 5.00 \text{ till } 5.50 \text{ ATS} = \text{amount to be paid monthly}$$

¹⁵ The tax rate of a petrol car with a fuel consumption of 10 litres is: $(10 - 3) * 2 = 14\%$. The tax results from the tax rate multiplied with the car price.

¹⁶ ECE resp. MVEG refer to the old and new method of measuring fuel consumption.

The differentiation between 5.00 and 5.50 ATS depends on the periodicity of payment: The lowest value has to be used when the payment occurs yearly, the highest has to be paid when the tax is paid monthly.

The tax increases by 20% for vehicles with fuel engine without catalytic converters whose first registration in Austria took place before January 1987. The importance of the differentiation is getting smaller, since the share of vehicles without catalytic converters decreases year by year.

The objective of the differentiation was to promote the purchase of vehicles with catalytic converters before they became compulsory. The measure was judged not to have been very successful. It is estimated that only 5–10% of the population have reacted to this measure. The reason for the small impact of the differentiation are seen in:

- As the measure was introduced there was uncertainty in regard to vehicles with catalytic converters. There were fears that these vehicles have a shorter life span. Additionally, the network of petrol station with lead free fuels was not very dense.
- The monetary incentive was judged to be too small to excite to the purchase of vehicles with catalytic converters.

- **Taxes on motoring**

Two different motoring taxes apply to passenger cars.

Taxes on motor fuels as of 1997:

Leaded petrol:	1 000 litres	Excise:	6 600 ATS
Unleaded petrol:	1 000 litres	Excise:	5 610,4 ATS
Diesel:	1 000 litres	Excise:	3 890 ATS

Table 19: Excise on 1 000 litres of motor fuel

Tolls on roads are existing throughout Austria. On 93% of the road network, passenger cars have to pay a "vignette". The current system is mainly based on fixed time-related charges – that is road user charges for a fixed period of time, like one day or month. The present charges do not depend on infrastructure use.

6.2. Database - A

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Population (millions)	7.690	7.769	7.868	7.962	8.015	8.040	8.055	8.068	8.075	8.100
Short Term Interest Rate	8,5%	9,1%	9,3%	7,2%	5,0%	4,5%	3,3%	3,5%	3,6%	-
Purchasing Power Index	-	109	108	112	111	111	112	111	110	110
New Vehicle Sales (passenger)	288.618	303.723	320.034	285.157	273.663	279.610	307.645	275.001	295.865	314.182
Car Sales per 1000 Capita	38	39	41	36	34	35	38	34	37	39
Passenger Vehicles in Use - Fleet (Millions)	-	3,100	3,245	3,368	3,480	3,594	3,691	3,783	3,887	4,012
Passenger Vehicles - Diesel Share	-	-	-	-	40,1%	42,7%	49,5%	53,6%	54,3%	56,7%
Passenger Vehicles - Non Diesel Share	-	-	-	-	59,9%	57,3%	50,5%	46,4%	45,7%	43,3%
Car Ownership per 1000 capita	388	403	418	428	437	448	459	470	482	495
Car Ownership - Growth	-	-	3,6%	2,5%	2,1%	2,6%	2,4%	2,3%	2,6%	2,8%
Average Age of vehicles (years)	6,5	6,4	6,4	6,5	6,6	6,8	6,8	7,0	-	-
GDP (billions) - (natural currency)	1.850	-	-	-	-	2.375	2.453	2.522	2.611	2.684
Total Tax Revenue as % of GDP	40,2%	40,6%	42,2%	42,6%	42,5%	41,6%	43,4%	44,2%	44,4%	44,3%
GDP (billions) - (EUROS)	134,4	-	-	-	-	172,6	178,3	183,3	189,7	195,1
GDP per capita (EUROS)	17.479	-	-	-	-	21.469	22.133	22.719	23.497	24.081
Registration Tax on Tax Revenue	-	-	-	-	0,16%	0,31%	0,00%	0,48%	0,47%	0,50%
Circulation Tax on Tax Revenue	-	-	-	-	0,47%	0,48%	0,00%	0,93%	0,99%	0,98%
Petrol Tax on Tax Revenue	-	-	-	-	2,42%	2,74%	3,40%	3,11%	3,06%	3,11%
Diesel Tax on Tax Revenue	-	-	-	-	1,01%	1,18%	-	-	-	-
Total Vehicle Related Taxes on Tax Revenue	-	-	-	-	-	4,71%	3,40%	4,51%	4,52%	4,60%
Registration Tax on GDP	-	-	-	-	0,07%	0,13%	0,00%	0,21%	0,21%	0,22%
Circulation Tax on GDP	-	-	-	-	0,20%	0,20%	0,00%	0,41%	0,44%	0,44%
Petrol Tax on GDP	-	-	-	-	1,03%	1,14%	1,48%	1,37%	1,36%	1,38%
Diesel Tax on GDP	-	-	-	-	0,43%	0,49%	**	**	**	**
Registration Tax Amount (Billions Natural Currency)	-	-	-	-	-	3,088	-	5,300	5,400	6,000
Circulation Tax Amount (Billions Natural Currency)	-	-	-	-	-	4,750	-	10,400	11,500	11,700
Registration Tax Amount (Billion EUROS)	-	-	-	-	-	0,224	-	0,385	0,392	0,436
Circulation Tax Amount (Billion EUROS)	-	-	-	-	-	0,345	-	0,756	0,836	0,850
Average Registration Tax amount per new vehicle (EUROS)	-	-	-	-	-	803	-	1401	1326	1388
Average Annual Circulation Tax per fleet vehicle (EUROS)	-	-	-	-	-	96	-	200	215	212
Petrol Tax Amount (Billions Natural Currency)	-	-	-	-	-	27,077	36,230	34,630	35,500	37,010
Diesel Tax Amount (Billions Natural Currency)	-	-	-	-	-	11,64	-	-	-	-
Petrol Tax Amount (Billion EUROS)	-	-	-	-	-	1,968	2,633	2,517	2,580	2,690
Diesel Tax Amount (Billion EUROS)	-	-	-	-	-	0,846	-	-	-	-
Total Annual Fuel Tax Amount (billion EUROS)	-	-	-	-	-	2,814	2,633	2,517	2,580	2,690
Average Fuel Tax Annual Amount per fleet vehicle (EUROS)	-	-	-	-	-	783	713	665	664	670
TOTAL ANNUAL VEHICLE RELATED TAXES AMOUNT (Billion EUROS)	-	-	-	-	-	4,609	2,633	3,658	3,808	3,976
AVERAGE TOTAL ANNUAL VEHICLE RELATED TAXES per fleet vehicle (EUROS)	-	-	-	-	-	1282	713	967	980	991

** - Data Not Available – Included in Petrol Taxes

7. Country Report: Germany

INTRODUCTION

In order to understand the German taxation system it should be noted that Germany is a federal state. This means, that the legislative competence and the revenue competence is split between the federal level (Bund), the federal states (Länder) and the municipalities.

The taxation of vehicles in Germany is a hotly debated subject. Citizens, the automobile production industry and touring clubs are all willing to pressure political decision makers at all levels of government. The automobile industry is an important employer in Germany and exerts a strong political influence when it comes to making political decisions in any transport area.

The taxation system in Germany regarding private cars is complicated in many ways. In order to clarify the levies (for the purpose of this paper), the taxation is classified into the following 4 areas:

1. The purchase of cars - All private new vehicle buyers pay VAT on the new vehicle price. No special or extra vehicle buying taxes are levied in Germany. The registration fee for new and newly bought vehicles is a fee levied to cover the costs of the registration procedure.
2. The *ownership of cars* - A yearly motor vehicle tax is required for each registered vehicle.
3. *The use of cars* - Dependant on the type and amount of fuel used, excise and VAT are levied on fuel purchases. All insurance premiums for vehicles are subject to an insurance tax. Although there are presently no motorway charges or taxes for private vehicles under 12 tonnes, it is presently being debated whether to introduce such charges in the future in the form of a vignette.
4. Tax benefits from vehicle ownership - In strong contrast to this direct taxation of cars is the reduction of taxable income or exemptions due to the ownership and use of private or company cars.

Congestion pricing is no issue at all in Germany, despite serious congestion problems and is therefore not included above. The same was true for road pricing related to passenger cars up until 2000. In this year the so called Pällmann study, which recommends the payment of a vignette for cars, was released. Generally, it can be stated that in Germany, increasing taxes and/or introducing new financial schemes such as road pricing are particularly heavily (and emotionally) discussed.

The purpose of taxing car transport in Germany is threefold: Firstly, the revenues should finance the building and maintenance of road infrastructure. This intention is reflected for example, in the earmarking of fuel tax revenues for federal road construction. However, in 1973 this earmarking of fuel tax revenues was amended in the respective federal budget laws and the revenues from fuel tax may now be spent for other purposes in the transport sector. Because of this, the second purpose of taxation revenues from cars can be considered to be the raising of general government income. Thirdly, cars are intended to be taxed at a rate proportional to the environmental damages they cause. Examples are the different fuel tax rates for leaded and unleaded petrol and for diesel as well as the vehicle tax reform from 1997 which has fixed tax rates for passenger cars according to their emissions.

In 1985 the tax rates for vehicle ownership use were linked, for the first time in Germany, to the rate of vehicle emissions. In 1999 the so called eco-tax, a usage dependant tax levied on the majority of energy sources, including diesel and gasoline, was passed. In 2000, the first annual eco-tax step (DM 0.06/l or € 0.03) was levied. This highly controversial tax increases the price of fuel by DM 0.06 /l (€0.03) at each step up until 2003.

It can be clearly seen from these measures, that instruments based on ecological criteria are the main drivers for new taxation measures in Germany today.

Table 21 gives an overview both on direct car related taxes and fees and on indirect financial issues according to the classification of taxes mentioned above. As can be seen from there the most important tax revenues are those raised from the fuel tax and the vehicle tax.

	Type	Related to:	Legislative competence	Revenues received:	Earmarking	Tax/fee level	Financial volume 1999 (billion)
Fuel tax	Tax	Use of cars	Federal (Bund)	Bund and federal states (länder)	a) 6 DP/l for urban transport infrastructure (€0.03/l) b) 1 DP/l for federal roads (€0.005/l) c) 50% of the remaining tax rate for federal roads apart from a) usually repealed by the federal budget law	a) leaded petrol: 1,14 DM/l (€0,58/l) b) unleaded petrol: 1,03 DM/l (€0,53/l) c) Diesel: 0,67 DM/l (€0,34/l) ¹⁾	DM 44.586 (€22.794)
Vehicle tax	Tax	Car ownership	Federal (Bund)	Federal states (länder)	none	<ul style="list-style-type: none"> • six different tax rates according to emissions • tax reduction for low-emission cars 	DM 13.767 (€7.038)
Insurance tax	Tax	Car ownership	Federal (Bund)	Federal (Bund)	none	15% of the insurance volume	DM 5,9 ³⁾ (€3.016)
Registration fee	Fee	Buying cars	Federal (Bund)	Federal states (länder)	none	DM 50,- per vehicle (new registration)	DM 0,18 ⁶⁾ (€0.092)
Fuel stock tax	Tax	Use of cars	Federal (Bund)	Federal (Bund)	none	a) leaded petrol: 0,0089 DM/l (€0.0045) b) unleaded petrol: 0,0089 DM/l (€0.0045) c) Diesel: 0,0075 DM/l (€0,0038)	DM 0,49 ⁷⁾ (€0.25)
Parking fees	Fee	Car ownership/ Use of cars	Federal (Bund)	Municipalities	Up to 1994 earmarked for financing parking facilities. Since 1994 not earmarked, but general revenue of municipalities	differs amongst the cities and according to the parking time	no data available
Tax reduction by commuting expenses	Indirect measure (reduction of taxable income)	Use of cars	Federal (Bund)	Reduction of federal tax revenues	-	70 DP/km, (€0,36) single commuting distance for the first 10km, thereafter 80DP/km (€0,41)	DM 8,4 ⁴⁾ (€4.30)
Depreciations of company cars	Indirect measure (reduction of taxable income)	Car ownership	Federal (Bund)	Reduction of federal tax revenues	-		DM 4,0 ⁵⁾ (€2.04)

1) from 1.4.1999 - b) The vehicle tax revenues from all vehicles amounted to DM bill. 14,4 in 1997.- 3) Figure for 1995. Estimated by DIW based on information of the Association of the German Insurance Industry.-4) Estimated by DIW for 1994.- 5) Figure for 1994. Estimated by Wuppertal-Institut für Klima, Umwelt, Energie.
Sources: DIW, BMV, Association of the German Insurance Industry, Wuppertal-Institut für Klima, Umwelt, Energie. 6) for 1997 7) approximate figure

Table 20: Fiscal measures for car passenger transport in Germany

7.1. The elements of the vehicle taxation system

7.1.1. Acquisition Taxes

Registration Tax (RT) and VAT

There is no special purchase tax for cars in Germany. All private vehicle owners pay a new car tax dependent on the vehicle price when buying new vehicles. The VAT levied on new vehicles is at the same rate the same as the normal VAT in Germany and was increased by 1% from 15 % to 16 % on the 1st April 1999. Apart from an administrative fee of between DM 35 (£17.90) and DM 160 (£81.80) (plus stamp duty) no further taxes or duties are required.

The fee covers services, such as the manufacture of number plates and the issuing of registration papers. These services are not taxed. The revenues are split between the federal motor transportation office and the federal state where the vehicle is registered.

Cars are usually admitted duty-free into Germany and are usually exempt from tax for one year from the date of importation. In Germany, no VAT is levied on the sale price of second hand cars.

7.1.2. Annual Circulation Tax (ACT)

Ownership of cars is taxed by the yearly vehicle tax and the insurance tax paid on insurance policies. Up until 1985 all vehicles paid a standard yearly circulation tax rate of DM 14.40 (£7.36) per 100 cc cylinder capacity. From the 1st of June 1985, this tax became emission dependant, giving relative tax reductions for vehicles with low rate of emissions. At the same time the tax rate was increased for vehicles with high rates of emissions. The goal of this move was to encourage the use of vehicles with catalytic converters. In 1990 new laws pertaining to the reduction of vehicle taxes for vehicles with low emissions were passed. Low emission vehicles were given tax reductions, older vehicles were given reductions if they were fitted with catalytic converters. At this time the separate taxation leaded and unleaded fuel was started. From 1989 onwards, the sale of leaded "normal" fuel was prohibited. Between 1989 and 1994, taxation increases on diesel fuel were less than those levied on gasoline. This was to aid the commercial transport sector, the major consumer of diesel fuel. To offset this inequality the yearly tax for commercial and private diesel vehicles was raised to above the rate for gasoline driven cars. The present system for the yearly taxing of vehicles was introduced in 1997. Passenger cars are taxed with six different tax rates that are based entirely on the emissions and the cylinder capacity of the vehicles. The amended law on the vehicle tax envisages an increase of these tax rates in one or two steps up to the year 2005, starting with the increases carried out in January 2001. Cars which meet the emission standards of Euro 3 and Euro 4 as well as low-emission cars (3 or 5 litre cars) are taxed with reduced rates for a limited time span up until the 31st of December 2005. Table 22 shows the tax rates for passenger cars in detail while table 23 summarises the temporary tax exceptions/reductions. The legislative competence for the vehicle tax lies at the federal level. Vehicle tax revenues fall to the federal states. The revenues are not earmarked. Severely handicapped citizens may be exempted from, or pay a reduced rate of vehicle ownership tax. The amount that this tax exemption represents can be considered to be small compared to the overall tax volume. The total revenue from the vehicle tax related to passenger cars amounted to DM 11.1 billion in 1997 (£5.67 billion) and DM 13.767 billion in 1999 (£7.038 billion). It is estimated, that the tax increases for vehicles starting 2001 will increase yearly tax revenues by DM 1.9 billion or € 0.971 billion. The goal of this form of taxation based on emissions is to encourage car owners to sell environmentally unfriendly cars and buy cars, that are emission reduced. The age of the total fleet is expected to be reduced by such measures.

	Tax rate in DM per 100 ccm									
	DM	€	DM	€	DM	€	DM	€	DM	€
Euro 3 cars/Euro 4 cars/3 litre cars										
• petrol cars			10,00	5,11	10,00	5,11	13,20	6,75	13,20	6,75
• diesel cars			27,00	13,8	27,00	13,8	30,20	15,44	30,20	15,44
Euro 2 cars										
• petrol cars	13,20	6,75	12,00	6,13	12,00	6,13	14,40	7,36	14,40	7,36
• diesel cars	37,10	18,97	29,00	14,83	29,00	14,83	31,40	16,05	31,40	16,05
Euro 1 and similar cars										
• petrol cars	13,20	6,75	13,20	6,75	21,20	10,84	21,20	10,84	29,60	15,13
• diesel cars	37,10	18,97	37,10	18,97	45,10	23,06	45,10	23,06	63,50	32,46
Other cars allowed to be used in case of ozone warning										
Low emission cars										
• petrol cars	21,60	11,04	21,60	21,60	29,60	15,13	29,60	15,13	41,20	21,06
• diesel cars	45,50	23,26	45,50	45,50	53,50	27,35	53,50	27,35	65,10	33,28
Cars not allowed to be used in case of ozone warning										
• petrol cars	13,20	6,75	33,20	16,37	41,20	21,06	41,20	21,06	49,60	25,36
• diesel cars	37,10	18,97	57,10	29,19	65,10	33,28	65,10	33,28	73,50	37,58
Others										
• petrol cars	18,80	9,61	41,60	21,27	49,60	25,36	49,60	25,36	49,60	25,36
• diesel cars	42,70	21,83	65,50	33,49	73,50	37,58	73,50	37,58	73,50	37,58

Source: Federal ministry of finances.

Table 21: Vehicle tax rates in Germany

Vehicle class	Max. Tax exception in DM ¹⁾	Max. Tax exception in €
Euro 3		
• petrol cars	250	127,81
• diesel cars	300	153,37
Euro 4		
• petrol cars	600	306,75
• diesel cars	1200	613,50
„3-litre cars“, max. CO ₂ -emissions 90 g/km	1000	511,25
„5-litre cars“, max. CO ₂ -emissions 120 g/km	500	255,62
¹⁾ All tax exceptions are valid up to 31 December 2005. - Source: Federal ministry of finances.		

Table 22: Exception from the vehicle tax according to the amended law from 1997

The **insurance tax** amounts to 15% of the insurance premium. According to calculations of DIW the revenues of the insurance tax for passenger cars amounted to DM bill. 5.9 or € 3.016 billion in 1995.

– Taxes on motoring

The usage related taxes consist of the fuel tax, a special tax for guaranteeing fuel reserves (Erdölbevorratungsbeitrag – stockpile fee) and parking fees. The most important tax is the fuel tax which yielded DM 56 billion (€28.630 billion) in 1997. From this amount, DM 42.4 billion (€21.677 billion) in revenues were from passenger cars. By 1999 this amount had increased to DM 44.6 billion (€22.802 billion). The tax rates vary between leaded and unleaded petrol and diesel (see table 21). VAT at the normal rate of 16 % is added to the price of automobile fuel and is approximately DM 0.07 /l (€0.031/l) at the present time. The eco-tax of DM 0.18/l (€0.09/l) is levied on all fuel in Germany. Yearly increases of DM 0.06/a (€0.03/a) from 2000 – 2003 are foreseen and the total increase will be DM 0.24/l (€0.0123/l). Basic data for fuel usage is supplied in Table 24.

	UNIT	1995	1996	1997	1998	1999
Average Price Gasoline	€/l	0,77	0,80	0,83	0,78	0,84
Average Price Diesel	€/l	0,58	0,62	0,63	0,58	0,64
Total Fuel Usage for private vehicles	Million l :	47 710	47 716	47 678	47 595	47 834
Fuel Tax revenues for private vehicles	Million €	21 858	21 783	21 705	21 667	22 794
Source: Verkehr in Zahlen 200						

Table 23: Basic data fuel usage

The fuel stockpile tax was introduced in order to guarantee the provision of fuel in case of oil shortages/crisis. The tax rate amounts to DM 0.89/kl (€0.46/kl) for petrol and DM 0.75/kl (€0.38/kl) for Diesel. In 1997 the revenues from this tax were DM 390 million or € 199 million. In 1998 and 1999 combined, the stockpile fee collected amounted to DM 994 million or €508 million (approximately DM 497 million or €254 million yearly).

The level of parking fees differs from city to city. Up to 1994 the revenues from parking fees were earmarked for financing parking facilities. Since 1994 the municipalities are free to treat the revenues as general income.

At the present time, distance related taxes are only relevant for commercial vehicles with a weight of over 12 tonnes. The Bundesamt für Güterverkehr (BAG) has been appointed on behalf of Ministry of Transport, to be the authority in charge to collect and manage distance related road user charges.

The annual gross-revenues from the Eurovignette for vehicles weighing more than 12 tonnes, amounted to DM 849 million in 1999 (€434 million). These include revenues from national (German) and international (EU or other) vehicles in Germany and the surrounding belt where Vignettes can be purchased. After clearing and reimbursements the annual revenues amount to 817 mill. DM or € 418 million in 1999 (763 million DM or €390 million in 1998) and are transferred to the federal budget.

Although there are currently no motorway charges or taxes for private vehicles under 12 tonnes, the introduction of such charges the form of a vignette is a hot topic of debate at the present time.

– Reduction of taxable income by commuting expenses

From the year 1955 employees have been entitled to reduce their taxable income (and consequently the income tax to be paid) because of commuting expenses occurred while using private cars. The reduction is a lump sum of DM 0.70 (€0.36) per km distance travelled between place of residence and working site (without proof). The overall tax reduction due to this possibility was estimated to be DM 8.4 billion or €4.3 billion in 1994. Those employees who use public transport could only reduce their taxable income by the factual costs incurred, which was, in most cases less favourable than car related commuting expenses.

In the year 2000 the tax reduction rate for private vehicles is DM 0.70 /km for the first 10 km and increased to DM 0.80 /km from the eleventh kilometre onwards (€0.36 and €0.41 respectively). At this time, other forms of transport to the work place will be treated the same as cars. The reduction of taxation revenues because of these increases cannot be estimated at the present time.

– **Reduction of taxable income by depreciations for company cars**

This is one of the most complicated issues in the German tax law. Companies can grant their employees the private use of company cars instead of a wage increase. This results in a lower level of income tax for the employee, compared to an equivalent wage increase. However, the employee has to pay taxes for the use of company cars. Since 1996 there is a new taxation rule relating to the private use of company cars, which makes this "tax break" less attractive. The employee has to submit a complete record of all trips with the company car including information on the purpose of the trip, the route, the date etc. Alternatively to this very time consuming procedure, 1% of the domestic list price for new vehicles is taxed, independent on the age of the car. Because the list price for new vehicles is taxed, even if the vehicle is a second-hand car or an older vehicle, this alternative is less lucrative for the tax payer. Indeed, difference between the two options can amount to a difference of between DM 500 (€255) and DM 700 (€358) per month for a middle class car. The absolute tax revenue reduction level caused by this tax break has not been calculated.

– **Earmarking procedures**

Fuel tax is a federal tax. About half of the revenues from fuel taxes are earmarked for the construction of federal roads. This is allowable, because of laws related to transport financing that were passed in 1955. In 1967, the Municipal Transportation Finance Act MTFAs was passed. This act earmarks a percentage of fuel taxes for the financing of public transport infrastructure on the urban level (DM 0.06 /€0.03 per litre). The respective revenues are transferred to the municipalities.

A further DM 0.01/€0.005 per litre of the revenues is earmarked for road construction at the federal level (motorways and federal roads). 50% of the remaining fuel tax revenues also are earmarked for roads at the federal level.

From 1975 onwards, annual federal budget can and does repeal earmarking of fuel tax revenues. In 1994 for example, an increase in fuel taxes was justified with raising funds for paying the debts of the German National Railways (DB AG). Furthermore, the fuel tax for diesel was increased to a lesser extent than petrol at this time, in order to guarantee the competitiveness of the German road haulier industry.

The VAT on fuel duty is a general tax and the principle of non-appropriation of public funds to specific purposes applies to it without qualification.

Vehicle tax revenues fall to the federal states and are not earmarked for use in the transport sector. Not being federal taxes, these revenues can not be earmarked for federal transport purposes either.

The revenues from the stock piling tax are collected by a special department (emergency storage fund) and are to be used to cover the costs of supplying oil in a crisis situation. Despite this, the stockpile tax for fuels is often considered to be a method of general federal revenue raising.

Present vignette revenues from vehicles weighing over 12 tonnes fall to the federal budget and are currently not earmarked. They are transferred to the federal budget and are used according to the respective demands. The future use of revenues from a road user charging system are part of the discussion running parallel to its development. Recently, it has been agreed that the additional revenues, which result from the transformation of the current time-based scheme to a km-based scheme, will be earmarked for the so-called "Anti-Stau-€3.8 billion (out of which DM 3.7 billion or €1.2 billion will be invested in the federal road network) between 2003 and 2007 for specific investments in the transport infrastructure, which are designed to ease traffic flow at bottleneck and congestion sites.

The majority of the revenues earned from the eco-tax are earmarked to go towards the National German Pension scheme. The additional input into the pension fund through this earmarking means that an increase in the rates of mandatory contribution payments can presently be avoided and it is planned to use the eco-tax revenues to lower the present rate of contributions.

7.2. Other Relevant Informations

– Summary of policy tendencies, discussions, new systems etc.

The major transport policy changes that are being discussed in Germany at the present moment concern the transformation of the current time-based charging system for all vehicle over 12 tonnes to a km-based charging system and the introduction of a vignette for all vehicles in Germany. These two major changes were recommended in a recently published study (Pällmann-Kommission), which was conducted on behalf of the Ministry of Transport. If these recommendations are fully implemented, the following vignette prices will be introduced for all private vehicles in 2003 (table 25).

Vehicle	Vignette [€/Year]
Motor bike	€ 20
Cars and light vehicles weight under 3,5 t	€ 40
Light vehicles weight between 3,5 and 7,5 t	€ 425
Busses weight above 3,5 t	€ 600
Goods vehicle weight between 7,5 and 12t	€ 600

Table 24: Suggested vignette prices for private vehicles from 2003

The same study recommends, that from 2003 vehicles over 12 t be charged a distance related road pricing fee. However, it should be mentioned that the transport minister has objected to the idea of a private car vignette or road pricing for private cars.

– Literature, studies on tax avoidance

Literature on tax avoidance for private vehicles in Germany has proven difficult to find. This does not mean that there is no way to avoid tax – no system is foolproof, but the level of non-payers is considered to be extremely small. When a car is registered in Germany, the Department of Taxation is notified by the registration authorities. The taxation office bills the car owner directly. If the required taxes are not forthcoming, the car in question will be defined as not registered by the police and its disposal maybe required.

A problem, that is considered to of more importance to Germany that tax evasion for private vehicles, is the price differentials between EU member states for new cars. A recent study from the European Commission shows, that in Germany, a total of 34 car models are more than 20 % more expensive than in other euro zone countries (<http://europa.eu.int/rapid/start>). This study shows, that in countries where the taxation of vehicle acquisition is relatively high, the price of the vehicle will be lower than in countries where the acquisition taxes are relatively low. This can and does result in citizens buying cars in other member states, but does not mean that taxation is avoided.

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– **Consumer behaviour/patterns**

The major point of public debate is the DM 0.06/l eco-tax increase in fuel (€0.03) that was introduced in April 2000. Because of the high price of fuel and the increases over the year, political pressure to reduce the eco-tax from the commercial transport industry and indeed private citizens was extreme.

– **Sales Statistics**

In the year 2000 the number of private cars registered in Germany reached 42.32 million. 3.38 million new cars were registered in 2000, this number represented a slightly downward trend from previous years. 7.34 million cars were sold second hand, which was also less than in previous years, see table 20. The average distance driven per vehicle in 1999 was 12 600 km for private cars, this number has remained relatively constant over the last 5 years. In 1999 there were approximately 230.700 km of roads (excluding urban roads) in Germany.

	1996	1997	1998	1999	2000
Total number of registered vehicles In cylinder capacity classes ¹⁾					
Less than 1499 cc	14 248 000	14 088 000	13 966 000	13 041 000	-
1500 – 1999 cc	21 047 000	21 523 000	21 910 000	23 338 000	-
More than 2000 cc	5 692 000	5 760 000	5 797 000	5 945 000	-
Total	40 987 000	41 371 000	41 673 000	42 324 000	-
Registration of new cars In cylinder capacity classes ²⁾					
Less than 1399 cc	1 002 083	971 554	1 062 115	1 061 516	900 492
1400 – 1999 cc	1 949 936	1 985 984	2 060 901	2 090 646	1 832 661
More than 2000 cc	544 021	570 77	612 758	649 804	645 074
Total	3 496 040	3 528 179	3 735 987	3 802 176	3 378 343
Number of cars sold second hand In cylinder capacity classes²⁾					
Less than 1399 cc	2 592 228	2 494 831	2 495 555	2 525 923	2 423 068
1400 – 1999 cc	3 955 943	3 879 632	3 956 524	4 132 895	3 973 387
More than 2000 cc	1 033 432	1 006 408	996 261	1 036 200	1 002 409
Other	1 477	1 268	1 115	928	779
Total	7 583 080	7 382 139	7 449 455	7 695 946	7 399 643
Average yearly distance per vehicle In km/a ¹⁾	12 600	12 700	12 700	12 600	-
<i>Sources: 1) „Verkehr in Zahlen 2000“ 2) „Kraftfahrt – Bundesamt“</i>					

Table 25: Basic statistics for cars registered in Germany 1996 - 2000

7.3. Database - D

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Population (millions)	79.113	79.753	80.275	80.975	81.338	81.539	81.817	82.012	82.057	82.200
Short Term Interest Rate	8,4%	9,2%	9,5%	7,2%	5,3%	4,5%	3,3%	3,3%	3,5%	-
Purchasing Power Index	-	107	109	109	110	110	110	108	107	106
New Vehicle Sales (passenger)	3.349.788	4.158.674	3.929.558	3.194.204	3.209.224	3.314.057	3.496.320	3.528.179	3.735.987	3.802.176
Car Sales per 1000 Capita	42	52	49	39	39	41	43	43	46	46
Passenger Vehicles in Use - Fleet (Millions)	-	35,003	36,042	38,772	39,765	40,404	40,988	41,372	41,674	42,438
Passenger Vehicles - Diesel Share	-	-	-	-	16,9%	14,6%	15,1%	15,0%	17,5%	19,0%
Passenger Vehicles - Non Diesel Share	-	-	-	-	83,1%	85,4%	84,9%	85,0%	82,5%	81,0%
Car Ownership per 1000 capita	447	442	452	483	491	497	503	506	508	516
Car Ownership - Growth	-	-	2,1%	6,9%	1,7%	1,2%	1,2%	0,6%	0,5%	1,6%
Average Age of vehicles (years)	6,1	8,0	7,4	6,9	6,9	6,8	6,7	6,7	-	-
GDP (billions) - (natural currency)	2.728	-	-	-	-	3.523	3.586	3.667	3.784	3.845
Total Tax Revenue as % of GDP	32,6%	36,8%	37,7%	37,9%	38,1%	38,2%	37,4%	37,0%	37,0%	37,7%
GDP (billions) - (EUROS)	1.395.0	-	-	-	-	1.801,3	1.833,5	1.874,7	1.934,8	1.965,8
GDP per capita (EUROS)	17.632	-	-	-	-	22.091	22.410	22.859	23.579	23.915
Registration Tax on GDP	-	-	-	-	-	-	-	-	-	-
Circulation Tax on GDP	-	-	-	-	-	0,40%	0,38%	0,39%	0,40%	0,40%
Petrol Tax on GDP	-	-	-	-	1,18%	1,15%	0,00%	1,08%	1,06%	1,16%
Diesel Tax on GDP	-	-	-	-	0,55%	0,55%	0,00%	0,53%	0,53%	0,52%
Total Vehicle Related Taxes on GDP	-	-	-	-	2,33%	2,32%	0,38%	2,00%	1,99%	2,08%
Registration Tax on Tax Revenue	-	-	-	-	-	-	-	-	-	-
Circulation Tax on Tax Revenue	-	-	-	-	1,13%	1,05%	1,02%	1,06%	1,08%	1,06%
Petrol Tax on Tax Revenue	0,00%	0,00%	0,00%	0,00%	3,10%	3,01%	0,00%	2,92%	2,86%	3,08%
Diesel Tax on Tax Revenue	0,00%	0,00%	0,00%	0,00%	1,44%	1,44%	0,00%	1,43%	1,43%	1,43%
Registration Tax Amount (Billions Natural Currency)	-	-	-	-	-	-	-	-	-	-
Circulation Tax Amount (Billions Natural Currency)	-	-	-	-	-	14,1	13,7	14,4	15,2	15,4
Registration Tax Amount (Billion EUROS)	-	-	-	-	-	-	-	-	-	-
Circulation Tax Amount (Billion EUROS)	-	-	-	-	-	7,2	7,0	7,4	7,8	7,9
Average Registration Tax amount per new vehicle (EUROS)	-	-	-	-	-	-	-	-	-	0,0
Average Annual Circulation Tax per fleet vehicle (EUROS)	-	-	-	-	-	178,3	171,4	178,2	186,1	185,7
Petrol Tax Amount (Billions Natural Currency)	-	-	-	-	-	40,5	-	39,6	40,0	44,6
Diesel Tax Amount (Billions Natural Currency)	-	-	-	-	-	19,4	-	19,4	20,0	20,0
Petrol Tax Amount (Billion EUROS)	-	-	-	-	-	20,7	-	20,2	20,5	22,8
Diesel Tax Amount (Billion EUROS)	-	-	-	-	-	9,9	-	9,9	10,2	10,2
Total Annual Fuel Tax Amount (billion EUROS)	-	-	-	-	-	30,6	-	30,2	30,7	33,0
Average Fuel Tax Annual Amount per fleet vehicle (EUROS)	-	-	-	-	-	757,9	-	729,1	736,1	778,1
Total annual vehicle related taxes amount (billion euros)	-	-	-	-	-	41,8	-	37,5	38,4	40,9
Average total annual vehicle related taxes per fleet vehicle (euros)	-	-	-	-	-	1.034,3	-	907,3	922,3	963,8

8. Country Report : Italy

8.1. The elements of the vehicle taxation system

8.1.1. Acquisition Taxes

Registration Tax (RT) and VAT

Registration Tax applies in Italy according to the engine's power. The formula is based on a flat rate of ITL 292.000 (150 EURO) till 53 kW; from 53 kW on, an additional per kW of ITL 6.800 is also applying. The flat rate mentioned may however be increased up to 20% more of the basic amount (ITL 350.400). The regions governed by ordinary statute are the beneficiaries of this tax. The tax is payable by the keepers of vehicles shown in the motor-vehicle registers.

Besides this tax provincial tax, called IPT which has replaced the previous IET and APIET taxes as of January 1st, 1999,, several other expenses (fees) are incurred in the acquisition. A series of duties relating to the completion of the formalities with the various public authorities such as the Motorization Directorate and the PRA (Pubblico Registro Automobilistico) are imposed on the registration of motor vehicles. These are duties of an administrative or fiscal nature. These additional costs are approximately ITL 150.000 for the Motorization Directorate and approximately ITL 80.500 for the PRA (Pubblico Registro Automobilistico) for both first registration and further transfer of vehicle ownership.

It should be noticed the rather reduced amount of registration taxes and fees applying in Italy, in comparison with other Member States analysed, in particular the fact that the expression of the fees is almost as high as the tax itself, although the latter is progressive with the engine's power from 53 kW.

The purchase of motor vehicles is also subject to a VAT rate of 20%, except on vehicles for disabled person, which are subject to a reduced VAT rate of 4%. The rate applicable on the case of second-hand vehicle transactions, from a taxable person, is also 20%, being the calculated on the profit margin. Transactions between private individuals are exempt from VAT whether they relate to private cars or commercial vehicles.

8.1.2. Annual Circulation Tax (ACT)

Basis of assessment

The basis of assessment of such taxes concerning passenger vehicles depends on the type of vehicle and engine's power measured in kW and the fact of being outstanding polluting vehicles such as the so-called 'non-ecological' diesel vehicles, in which cases are further imposed significant surtaxes.

Rate

From 1 January 1998, vehicles are liable to tax based on actual power instead of fiscal horsepower, except those charged on the basis of capacity and those specified in DL No 43 of 24 February 1997, while the minimum motor-vehicle tax is ITL 37 000

The annual rate of tax for motor cars can be calculated by multiplying the figure stamped on the logbook (beside the abbreviation 'kW') by ITL 5 000. For example, a car of power 55 kW will pay ITL 275 000 a year. This figure is found by multiplying the 55 kW by ITL 5 000. On logbooks issued earlier than the years 82-83, the actual power is not given as kW but as horsepower, shown with the abbreviation 'CV'. This is seen where, beside the item 'pot. Max' (maximum power) the symbol CV is found instead of kW. In these cases, the figure printed beside (or above) the abbreviation CV (generally on the third page of the old books) is to be multiplied by ITL 3 680 instead of 5 000.

For example, a car with a logbook showing the following details: 'pot. max CV 71' will pay ITL 261 000, which is calculated as follows: $71 \text{ CV} \times \text{ITL } 3\,680 = \text{ITL } 261\,280$, rounded to 261 000.

Further more, diesel must pay an annual surtax added to ownership tax of ITL 10.145 per kw of engine's power, but this concern only the 'non-ecological' diesel vehicles. Also for certain motor cars an additional annual surtax is due to the State. On the other hand, the surtax is reduced by 50 % in the case of hire cars, taxis and vans of a net capacity of 600 kg or more owned by firms and registered for goods transport. Motor cars and vehicles used for mixed passenger and goods transport are not subject to the surtax. Vehicles first put on the road after February 1992 are not subject to such surtaxes.

If there are decimals in the kW or CV figure, they are to be ignored (even if over five tenths), always rounding down to the whole unit below. The amount payable is rounded to the thousand lire below if the odd amount is ITL 500 or less, and to the thousand lire above where it is more than ITL 500. The minimum amount of motor-vehicle tax is ITL 37 000, and the minimum-payment rule therefore applies to reduced rates on the basis of the steps shown in Scale G annexed to Law No 463 of 21 May 1955. The scales are determined from the amounts in force at 31 December 1994 (plus a percentage under Article 3(154) of Law No 549 of 28 December 1995).

It should also be stressed that, unlike the power-based scales, the scales on capacity and seating are not uniform throughout Italian territory but vary on a regional basis, having regard for the scale variations occurring up to 10 November 1997 under Article 24 of Dlg No 504 of 1992.

Motor-vehicle taxes on goods vehicles with a total weight of 12 tonnes or more are based on the total weight, the number of axles and the type of suspension on the drive axle. The tax chargeable on lorries is divided into scale groups, which differ according to the region of registration of the lorry. There are unified rates nationally for tractor-trailer combinations. The tax is reduced by 20 % on goods vehicles of 12 tonnes or more fitted with a pneumatic suspension on the drive axle or axles or with a suspension recognised as equivalent.

8.2. Database – I

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Population (millions)	56.694	56.744	56.757	56.960	57.138	57.269	57.333	57.461	57.563	57.700
Short Term Interest Rate	12,3%	12,2%	14,0%	10,2%	8,5%	10,3%	8,7%	6,8%	4,9%	-
Purchasing Power Index	-	106	105	102	103	104	104	102	104	103
New Vehicle Sales (passenger)	2.307.055	2.249.990	2.372.347	1.695.428	1.671.766	1.731.747	1.732.198	2.403.744	2.378.592	2.352.218
Car Sales per 1000 Capita	41	40	42	30	29	30	30	42	41	41
Passenger Vehicles in Use - Fleet (Millions)	-	28,435	29,430	29,652	29,665	30,301	30,624	31,107	31,371	32,006
Passenger Vehicles - Diesel Share	-	-	-	-	9,1%	10,5%	16,5%	17,3%	22,3%	23,1%
Passenger Vehicles - Non Diesel Share	-	-	-	-	90,9%	89,5%	83,5%	82,7%	77,7%	76,9%
Car Ownership per 1000 capita	483	502	519	522	521	530	535	543	546	555
Car Ownership - Growth	-	-	3,4%	0,7%	-0,3%	1,8%	0,8%	1,5%	0,6%	1,6%
Average Age of vehicles (years)	7,4	7,3	7,4	7,7	7,9	8,1	8,3	8,2	-	-
GDP (billions) - (natural currency)	1.320.832	-	-	-	-	1.787.278	1.902.275	1.983.850	2.067.703	2.100.786
Total Tax Revenue as % of GDP	38,9%	39,3%	41,7%	44,2%	41,4%	41,2%	42,7%	44,2%	42,7%	43,0%
GDP (billions) - (EUROS)	682,2	-	-	-	-	923,1	982,4	1.024,6	1.067,9	1.085,0
GDP per capita (EUROS)	12.032	-	-	-	-	16.118	17.136	17.831	18.551	18.804
Registration Fees on GDP	-	-	-	-	0,05%	0,05%	0,05%	0,06%	0,06%	0,06%
Circulation Tax on GDP	-	-	-	-	0,08%	0,08%	0,07%	0,07%	0,09%	0,09%
Petrol Tax on GDP	-	-	-	-	1,34%	1,37%	-	1,24%	-	1,20%
Diesel Tax on GDP	-	-	-	-	0,69%	0,76%	-	0,64%	-	0,61%
Total Vehicle Related Taxes on GDP	-	-	-	-	2,48%	2,56%	0,12%	2,02%	0,15%	1,95%
Registration Tax on Tax Revenue	-	-	-	-	0,12%	0,12%	0,11%	0,14%	0,14%	0,13%
Circulation Tax on Tax Revenue	-	-	-	-	0,19%	0,19%	0,17%	0,17%	0,21%	0,20%
Petrol Tax on Tax Revenue	-	-	-	-	3,24%	3,33%	-	2,81%	-	2,79%
Diesel Tax on Tax Revenue	-	-	-	-	1,67%	1,84%	-	1,45%	-	1,41%
Registration Tax Amount (Billions Natural Currency)	-	-	-	-	-	893,6	893,9	1.240,4	1.227,4	1.213,8
Circulation Tax Amount (Billions Natural Currency)	-	-	-	-	-	1.429,8	1.414,3	1.465,7	1.843,3	1.843,3
Registration Tax Amount (Billion EUROS)	-	-	-	-	-	0,5	0,5*	0,6	0,6*	0,6
Circulation Tax Amount (Billion EUROS)	-	-	-	-	-	0,7	0,7*	0,8	1,0*	1,0
Average Registration Tax amount per new vehicle (EUROS)	-	-	-	-	-	266,5	266,5*	266,5	266,5*	266,5
Average Annual Circulation Tax per fleet vehicle (EUROS)	-	-	-	-	-	24,4	23,9*	24,3	30,3*	29,7
Petrol Tax Amount (Billions Natural Currency)	-	-	-	-	-	24.485,7	-	24.640,0	-	25.190,5
Diesel Tax Amount (Billions Natural Currency)	-	-	-	-	-	13.583,3	-	12.743,0	-	12.743,0
Petrol Tax Amount (Billion EUROS)	-	-	-	-	-	12,6	-	12,7	-	13,0
Diesel Tax Amount (Billion EUROS)	-	-	-	-	-	7,0	-	6,6	-	6,6
Total Annual Fuel Tax Amount (billion EUROS)	-	-	-	-	-	19,7	-	19,3	-	19,6
Average Fuel Tax Annual Amount per fleet vehicle (EUROS)	-	-	-	-	-	648,9	-	620,7	-	612,1
TOTAL ANNUAL VEHICLE RELATED TAXES AMOUNT (Billion EUROS)	-	-	-	-	-	23,6	-	20,7	-	21,2
AVERAGE TOTAL ANNUAL VEHICLE RELATED TAXES per fleet vehicle (EUROS)	-	-	-	-	-	779,8	-	665,6	-	661,4

* - Estimate

9. Country Report: United Kingdom

INTRODUCTION

The taxation system in the UK regarding private cars is classified into the following 4 areas:

1. The purchase of cars - All private new vehicle buyers pay VAT on the new vehicle price. No further taxes are levied on the sale price of vehicles in the UK.
2. The ownership of cars - A yearly motor vehicle tax is required for each registered vehicle. This tax is known as Vehicle Excise Duty (VED).
3. The use of cars - Dependant on the type and amount of fuel used, excise and VAT are levied on fuel purchases.
4. Business cars – Tax benefits may be obtained through the use of company cars.

Car transport is taxed for a number of reasons in the UK. The raising of funds for the general budget is a major aim. The reduction of vehicle related negative effects is also considered to be a goal of taxation.

In 1999 new vehicles were taxed for the first time according to their pollution potential. The goal of the changed VED is to reduce emissions in general and the emission of CO₂ specifically. Before these changes, the yearly tax for private vehicles was a fixed tax, independent of vehicle or engine size.

Fuel duty, justified by the environmental aspects of fuel usage, has been charged since the early 1990s in the UK. The reduction of the use of leaded petrol is considered to be directly related to the price increases in leaded fuel as compared to unleaded and diesel fuels.

An actual active area of discussion is the introduction of congestion charging – especially in London. The proposed daily fee for entering the centre of London is £ 5 (£8) for private cars and £ 15 (£24) for goods vehicles (www.london.gov.uk/mayor/congest/congchg2.htm - 23k). At these fee levels, the revenue from congestion charging in London is estimated to be £ 200 million or £321 yearly.

9.1.1. Acquisition Taxes

Registration Tax (RT) *and* VAT

There is no special purchase tax for cars in the UK. All private vehicle owners pay VAT on new cars dependent on the vehicle price. The VAT levied on new vehicles is at the same rate the same as the normal VAT in the UK and is presently 17.5 %. Apart from a administrative fee of £ 25 (£40) no further taxes or duties are required. This fee was introduced on the 1st of April 1998. This fee covers the services required to obtain car registration papers. These services are not taxed and they are free of VAT.

9.1.2. Annual Circulation Tax (ACT)

Ownership of cars in the UK is taxed by a yearly vehicle excise duty (VED). The VED is considered by the government to be a tax that all motorists contribute to, regardless of the distance driven. The goals of the VED are to raise revenue for the building and repair of road infrastructure. A further objective is considered to be the reduction of the number of registered vehicles (and thus congestion and parking problems) by discouraging second-car ownership.

From 1985 until 1992 the VED was raised at the flat rate of £ 100/€160 for all cars and light goods vehicles. This flat fee was increased in March of 1992 to £ 110/€176 and successfully increased in subsequent years. In 1998 the VED was £ 155/€249.

In 1999 VED levied on cars with small engines (up to 1,100 ccs) was reduced by £ 55/€88 per vehicle. This decision was based on the fact, that smaller cars tend use less fuel and be more efficient and thus less polluting than larger cars. In 2000 this reduction was extended to include all cars up to 1.200 cc. All together approximately 3 million cars benefit from these VED reductions.

Effective from the 1st of March 2001, the VED is will be completely dependent on the vehicle emissions and engine size. Cars over 1,200 cc pay a flat rate of £ 160/€257 yearly (or £ 88/€141 half yearly) and private vehicles under 1,200 cc pay one of 4 rates depending on the car's emissions.

9.2. Other Relevant Informations

– Taxes on Motoring

The most important vehicle use tax is the fuel tax which yielded € 34.1 billion in revenues in 1998/99 from all vehicles. The tax rates vary between leaded and unleaded petrol and diesel. VAT at the normal rate of 17.5 % is added to the price of automobile fuel and is approximately £ 0.12 /€0.19/l at the present time.

In the 2001 budget a freeze on all road fuel and oil duties was implemented. This effectively means a reduction in the real price of petrol by about £ 0,015/l reducing tax revenues by £ 560 million (€899 million) in 2001 –2002. Tax on ultra-low sulphur unleaded petrol will be reduced by a further £ 0.02/l (€0.032/l) and on ultra-low sulphur diesel by £ 0.03/l (€0.048/l) in this year.

There are several direct charges for using road infrastructure in the UK. These charges are mainly for the crossing of major rivers and can be considered to be charges rather than taxes.

– The special case of business cars

The taxation of company cars is one of the most criticised points in the taxation of vehicles in the UK. Basically, the tax benefits of company cars increases with the mileage driven. Certain tax break mileage thresholds exist (for example at 2,500 miles) and research shows, that that these thresholds act as a mileage incentive to business car owners. In general business cars are driven more than double the mileage of private cars and only half this mileage is for business purposes.

At the 2000 budget it was announced, that from 2002 this form of mileage based tax breaks will be changed to a system where the fuel usage and CO2 emissions are the deciding factors in the tax rate. There will no longer be a tax incentive to drive unnecessary extra business miles.

Because of the reduction in the tax benefits of using business cars, wage increases rather than company car benefits are being increasingly offered by firms in the UK. In 1989 13 % of all registered cars were company cars. This number had decreased to 10.3 % in 1997, however at this time the proportion of newly registered cars which were company cars remained at slightly over 50 %

The level of taxation revenues or the amount of tax breaks due to the special system of taxing business cars can not be assessed.

– **Summary of taxation revenues for cars and light goods vehicles**

		Road Taxes [£/€ millions]		
Vehicle Class	Number of Vehicles (thousands)	Fuel Tax	Vehicle Excise Duty	Total
Cars, light goods vehicles and taxis	25 549	£16 360	£4 380	£20 740
		€6 260	€7 030	€33 280
Motorbikes	724	£70	£35	£105
		€112	€56	€168

Source: Department of the Environment, Transport and the Regions

Table 26: Road taxation revenue in 1998/99

It is clear, that fuel tax is the major source of taxation revenue from private vehicles.

– **Summary of policy tendencies, discussions, new systems etc.**

In the UK, vehicles with low levels of emissions will be taxed less than those with higher relative emission levels. It is estimated that these changes in tax rates will effect the overall fleet structure and reduce emissions from vehicles. The first of these Vehicle Excise Reductions were carried through in 1999 for busses and heavy goods vehicles. At this time, smaller-engined cars, were required to pay a reduced Vehicle Excise Duty (VED) (£ 55/€88 less per vehicle) than larger cars. This decision was based on the fact, that smaller cars tend to be more efficient and less polluting than larger cars.

In March 2001 a graded VED system was introduced for all new cars. The grading is primarily dependant on the emissions of CO₂. Lower emissions correspond to lower VED. Also vehicles that run on cleaner, alternative fuels will pay lower VED. Diesel run vehicles will not be assessed by CO₂ emissions, but on their overall emission level. It is hoped, that this will create an incentive to motor vehicle manufactures to develop pollution reducing technology. Fuel is also taxed by its pollution potential. For example, the excise on ultra low sulphur petrol was decreased in October 2000 in order to promote its usage.

– **Literature, studies on tax avoidance**

A major report on the evasion of vehicle excise in the UK was published in February 2000 by the Department of the Environment, Transport and the Regions (Statistical bulletin (00)13). The evasion of vehicle excise was measured by directly observing a representative amount of traffic on various roads and recording licence plate numbers for comparison with official registry data. The data was then extrapolated for a total country estimate. The results of the study show, that approximately 2.3 % of private and light goods vehicles are not registered and so avoid paying vehicle excise. In 1994 this number for the same category was estimated to be 3 %. This number varies in the regions examined and by the time of day and day of the week. With the average licence fee being £ 155/£249 for private vehicles and light goods vehicles, a loss of £ 135.1 million (£217 million) was estimated to be the total revenue loss for this vehicle category. For all road vehicles the total revenue loss was estimated to be £ 183.3 million (£294 million). As can be quickly seen from these figures, the revenue loss from unlicensed vehicles is mainly from private cars and light goods vehicles. Between 1994, the time of the last survey and 1999 the number of unlicensed cars and light goods vehicles had decreased, but due to the raise in the average cost of licences, the total revenue loss had increased by almost 11 %.

In order to decrease the likelihood of vehicle owners not registering their cars in order to save the registration fee, the Driver and Vehicle Licensing Agency (DVLA) will install a network of mobile cameras that can detect, record and compare the registration marks of vehicles with the official registry of vehicles. Owners driving unregistered cars will be prosecuted.

9.3. Database - UK

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Population (millions)	57.459	57.685	57.907	58.099	58.293	58.500	58.704	58.905	59.090	59.391
Short Term Interest Rate	14,8%	11,5%	9,6%	5,9%	5,5%	6,7%	6,0%	6,8%	7,3%	5,5%
Purchasing Power Index	-	97	98	99	98	96	99	102	103	103
New Vehicle Sales (passenger)	2.008.934	1.592.326	1.593.600	1.778.426	1.910.933	1.945.366	2.025.450	2.170.725	2.247.403	2.197.615
Car Sales per 1000 Capita	35	28	28	31	33	33	35	37	38	37
Passenger Vehicles in Use - Fleet (Millions)	-	22,744	23,008	23,402	23,832	24,307	24,865	25,594	26,269	27,095
Passenger Vehicles - Diesel Share	-	-	-	-	22,6%	20,8%	18,1%	16,2%	15,3%	14,8%
Passenger Vehicles - Non Diesel Share	-	-	-	-	77,4%	79,2%	81,9%	83,8%	84,7%	85,2%
Car Ownership per 1000 capita	361	396	399	404	410	417	425	436	446	456
Car Ownership - Growth	-	-	0,8%	1,3%	1,5%	1,7%	1,9%	2,6%	2,3%	2,3%
Average Age of vehicles (years)	5,3	5,3	5,6	5,7	5,8	5,9	6,1	6,1	-	-
GDP (billions) - (natural currency)	555	-	-	-	-	713	755	804	847	867
Total Tax Revenue as % of GDP	36,0%	35,3%	34,8%	33,3%	34,0%	35,2%	35,1%	35,3%	37,2%	36,6%
GDP (billions) - (EUROS)	882,3	-	-	-	-	1.133,7	1.200,6	1.279,1	1.348,0	1.379,0
GDP per capita (EUROS)	15.355	-	-	-	-	19.379	20.452	21.714	22.812	23.219
Registration Tax on GDP	-	-	-	-	-	-	-	0,00%	0,00%	0,00%
Circulation Tax on GDP	-	-	-	-	0,57%	0,57%	0,55%	0,54%	0,55%	0,55%
Petrol Tax on GDP	-	-	-	-	1,43%	1,41%	-	-	-	1,55%
Diesel Tax on GDP	-	-	-	-	0,64%	0,72%	-	1,02%	-	0,34%
Total Vehicle Related Taxes on GDP	-	-	-	-	2,65%	2,73%	0,55%	1,56%	2,09%	2,44%
Registration Tax on Tax Revenue	-	-	-	-	-	-	-	-	-	-
Circulation Tax on Tax Revenue	-	-	-	-	1,68%	1,62%	1,57%	1,53%	1,47%	1,49%
Petrol Tax on Tax Revenue	-	-	-	-	4,21%	4,01%	-	-	4,16%	4,22%
Diesel Tax on Tax Revenue	-	-	-	-	1,88%	2,05%	-	2,89%	-	0,94%
Registration Tax Amount (Billions Natural Currency)	-	-	-	-	-	-	-	-	-	-
Circulation Tax Amount (Billions Natural Currency)	-	-	-	-	-	4,1	4,1	4,3	4,6	4,7
Registration Tax Amount (Billion EUROS)	-	-	-	-	-	-	-	-	-	-
Circulation Tax Amount (Billion EUROS)	-	-	-	-	-	6,5	6,6	6,9	7,4	7,5
Average Registration Tax amount per new vehicle (EUROS)	-	-	-	-	-	0,0	0,0	0,0	0,0	0,0
Average Annual Circulation Tax per fleet vehicle (EUROS)	-	-	-	-	-	265,8	265,5	269,4	280,5	278,2
Petrol Tax Amount (Billions Natural Currency)	-	-	-	-	-	10,0	-	-	13,1	13,4
Diesel Tax Amount (Billions Natural Currency)	-	-	-	-	-	5,1	-	8,2	-	3,0
Petrol Tax Amount (Billion EUROS)	-	-	-	-	-	16,0	-	-	20,8	21,3
Diesel Tax Amount (Billion EUROS)	-	-	-	-	-	8,2	-	13,0	-	4,7
Total Annual Fuel Tax Amount (billion EUROS)	-	-	-	-	-	24,1	-	13,0	20,8	26,0
Average Fuel Tax Annual Amount per fleet vehicle (EUROS)	-	-	-	-	-	993,4	-	509,8	793,5	961,3
TOTAL ANNUAL VEHICLE RELATED TAXES AMOUNT (Billion EUROS)	-	-	-	-	-	30,9	6,6	19,9	28,2	33,6
AVERAGE TOTAL ANNUAL VEHICLE RELATED TAXES per fleet vehicle (EUROS)	-	-	-	-	-	1.273,2	265,5	779,2	1.074,0	1.239,5